

**EIS
SUB-APPENDIX G**

**FISH AND WILDLIFE COORDINATION ACT REPORT
(FWCAR)**

**FINAL
FEASIBILITY REPORT
AND ENVIRONMENTAL IMPACT STATEMENT
PORT EVERGLADES HARBOR NAVIGATION STUDY
BROWARD COUNTY, FLORIDA**



United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

August 20, 2013



Alan M. Dodd
District Commander
U.S. Army Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

Service Federal Activity Code: 2007-FA-1548

Project: Port Everglades Harbor Navigational
Improvements

County: Broward

Dear Colonel Dodd:

In accordance with the Fiscal Year 2003 Transfer Fund Agreement between the U.S. Fish and Wildlife Service (Service) and the U.S. Army Corps of Engineers (Corps), the Service provided to the Corps a draft Fish and Wildlife Coordination Act (FWCA) report in March 2005, for the Port Everglades Harbor navigation project (Port Project), Broward County, Florida. This draft report was provided in accordance with the FWCA of 1958, as amended (48 Stat.401; 16 U.S.C. 661 et seq.) and under the provisions of section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 et seq.), to provide an evaluation of environmental effects of navigation improvements to Port Everglades. The Service concluded implementation of the recommended project plan may impact fish and wildlife resources directly and indirectly as a result of dredging and/or blasting activities. The fish and wildlife resources likely to be directly and indirectly affected included seagrass, low relief hardbottom, high relief coral reefs, rock/rubble habitat, and shallow sandy bottom habitat.

The Service provided extensive recommendations in the 2005 draft FWCA report to further minimize or avoid possible adverse effects of the Port Project on fish and wildlife resources. Specifically, the Service suggested the following to compensate for the temporal loss of function and value of the impacted habitats:

1. Increase the mitigation ratio (*e.g.*, to 3:1) for mangroves if the 8.48 acres in the conservation easement cannot be avoided;
2. Increase the mitigation ratio for impacted seagrass habitat from 1:1 to 3:1 for a total of 15 acres;
3. Develop a Seagrass Monitoring Plan that contains success criteria that are consistent with Fonseca et al. (1998);



4. Create a 51-acre mitigation reef to compensate for direct impacts to high and low relief hardbottom reef habitat;
5. Provide adequate mitigation for the temporal loss of function and value associated with the low relief hardbottom habitat located within the previously dredged channels, particularly the channel walls;
6. Continue to seek alternative methods to mitigate for reef impacts through the Port Everglades Reef Group; and
7. Develop a comprehensive (pre, during, and post project) environmental monitoring program to verify that project impacts occurred within the levels anticipated and to ensure that the mitigation areas are performing to a level where habitat replacement values are maintained.

In addition, the Service recommended inclusion of the following items in the project plan to further minimize and reduce potential adverse effects of blasting on listed species:

1. The Florida Fish and Wildlife Conservation Commission (FWC) and Service must review a blasting proposal prior to any blasting activities. The blasting proposal must include information concerning a watch program and details of the blasting events. This information must be submitted in writing at least 30 days prior to the proposed date of the blast(s) to the FWC, OES-BPS, 620 South Meridian Street, Tallahassee, Florida 32399-1600 and to the Service's South Florida Ecological Services Office, 1339 20th Street, Vero Beach, Florida 32960. At a minimum, the proposal should include the following information:
 - 1a. A list of observers, qualifications, and positions for the watch, including a map depicting the proposed locations for the boat or land-based observers; and
 - 1b. The amount of explosive charge proposed, the explosive charge's equivalency in TNT, how it will be executed (depth of drilling, in-water, etc.), a drawing depicting the placement of the charges, size of the safety radius and how it will be marked (also depicted on a map), tide tables for the blasting event(s), and time tables (days and times) for blasting event(s);
2. A formal watch coordination meeting must be held at least 2 days prior to the first blast event. Attendants should include the designated observers, construction contractors, demolition subcontractors, and other interested parties such as the Service, FWC, and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries). All participants will be informed about the possible presence of manatees, dolphins, sea turtles, or whales in nearshore areas, and that civil or criminal penalties can result from harassment, injury, and/or death of a listed species;
3. The watch program should begin at least 1 hour prior to the scheduled start of blasting to identify the possible presence of manatees, dolphins, sea turtles, or whales, if applicable. The watch program shall continue until at least 0.5 hour after detonations are completed;

4. The watch program shall consist of a minimum of six observers. Each observer shall be equipped with a two-way radio that shall be dedicated exclusively to the watch program. Extra radios should be available in case of failures. All of the observers shall be in close communication with the blasting subcontractor in order to halt the blast event if the need arises. If all observers do not have working radios and cannot contact the primary observer and the blasting subcontractor during the pre-blast watch, the blast shall be postponed until all observers are in radio contact. Observers will be equipped with polarized sunglasses, binoculars, a red flag for backup visual communication, and a sighting log with a map to record sightings. All blasting events will be weather dependent. Climatic conditions must be suitable for optimal viewing conditions, as determined by the observers;
5. The watch program shall include a continuous aerial survey to be conducted by aircraft. The event shall be halted if an animal(s) is spotted within 300 feet of the perimeter of the safety zone or the danger zone as defined by the Corps in their project description. An "all-clear" signal must be obtained from the aerial observer before detonation can occur. The blasting event shall be halted immediately upon request of any of the observers. If animals are sighted, the blast event shall not take place until the animal(s) move out of the area under their own volition. Animals shall not be herded away or harassed into leaving. Specifically, the animal must not be intentionally approached by project watercraft. If the animal(s) is not sighted a second time, the event may resume 30 minutes after the last sighting;
6. The observers and contractors shall evaluate any problems encountered during blasting events and logistical solutions shall be presented to the Service and the FWC. Corrections to the watch shall be made prior to the next blasting event. If any one of the aforementioned conditions is not met prior to or during the blasting, the watch observers shall have the authority to terminate the blasting event until resolution can be reached with the Service and FWC;
7. If an injured or dead marine mammal or sea turtle is sighted after the blast event, the watch observers shall contact the Service at 772-562-3909 and the FWC through the Manatee Hotline at 1-888-404-3922. The observers shall maintain contact with the injured or dead marine mammal or sea turtle until authorities arrive. Blasting shall be postponed until the Service and FWC can determine the cause of injury or mortality. If blasting injuries are documented, all demolition activities shall cease. A revised plan shall then be submitted to the Service and FWC for approval; and
8. Within 14 days after completion of all blasting events, the primary observer shall submit a report to the Service and FWC providing a description of the event, number and location of animals seen and what actions were taken when the animals were seen. Any problems associated with the events and suggestions for improvements shall also be documented in the report.

Since the 2005 draft FWCA report was completed, the Port Project has been modified as outlined in the Corps' June 28, 2013, Draft Feasibility Report and Environmental Impact Statement (EIS) (Figures 1 and 2). Modifications to the proposed project under the current Tentatively Selected Plan (TSP) include:

1. Extending the Outer Entrance Channel (OEC) 2,200 feet seaward with an 800-foot width, and deepening the existing 500-foot wide OEC from 45 to 55 feet;
2. Deepening the Inner Entrance Channel from 42 to 48 feet;
3. Deepening the Main Turning Basin (MTB) from 42 to 48 feet;
4. Widening the rectangular shoal region southeast of the MTB by approximately 300 feet and deepening it to 48 feet;
5. Widening the Southport Access Channel (SAC) in the proximity of berths 23 to 26 (the knuckle) by approximately 250 feet and relocating the U.S. Coast Guard (USCG) facility, a General Navigation Feature (GNF), easterly on USCG property;
6. Shifting the existing 400-foot wide SAC approximately 65 feet to the east near berth 26 to the south end of berth 29 to transition from the knuckle area widening to the existing Federal channel limits;
7. Deepening the SAC from approximately berth 23 to the south end of berth 32 from 42 to 48 feet;
8. Deepening the Turning Notch (TN), including the Port Authority planned expansion, from 42 to 48 feet, with nearby widening including: widening the eastern edge of the SAC 100 feet along a 1,845-foot stretch parallel to the SAC, and widening the western edge of the SAC for access to the TN from the existing Federal channel near the south end of berth 29 to a width of approximately 130 feet at the north edge of the TN;
9. Other GNFs; and
10. Environmental mitigation.

Construction will be accomplished through a combination of traditional dredging methods and the use of explosives inshore and offshore. Unconsolidated and consolidated material generated during dredging will be deposited within approved offshore and/or upland disposal sites. Expansion of the offshore Ocean Dredged Material Disposal Site (ODMDS) is required, and analysis for selecting an ODMDS footprint is currently underway.

FISH AND WILDLIFE RESOURCES

This section is provided in accordance with the FWCA of 1958, as amended (48 Stat. 401; 16 U.S.C. 661 *et seq.*) to address other fish and wildlife resources in the project area.

Seagrasses

The Corps estimates a total of 4.01 acres of seagrass (3.57 acres of Johnson's seagrass [*Halophila johnsonii*] and 0.44 acre of other seagrass), and 1.16 acres of mangroves will be impacted as a result of the Port Project. As compensation for these impacts, the Corps evaluated three mitigation alternatives for functions of seagrass habitats lost due to the implementation of the TSP, but only one alternative was feasible based in part on the Incremental Cost Analysis. Following detailed analyses and cost assessments, the Corps proposes the following:

1. To use 1 mangrove and 2.4 seagrass functional units from an on-going habitat enhancement and restoration project at West Lake Park (WLP).

The WLP project includes previously permitted restoration, enhancement, and preservation of like habitats in this County-operated, State-owned natural area located to the south of the Port Project. The WLP project does not comprise a mitigation bank, and its use for mitigation is not available for purchase by the public or private entities. Credits (units of increased ecological functional value) compiled in association with the existing WLP permit (for restoration/enhancement activities) are specifically limited for use as mitigation for Broward County projects (and further, specifically the Port Project and airport expansions). Broward County (the local sponsor) will bear the responsibility for construction, monitoring, and success of mitigation at WLP. The estimated costs for mangrove wetland enhancements and seagrass restoration WLP are \$238,000 and \$4.84M, respectively.

Hardbottom reef habitat

The Corps estimates that a total of 15.23 acres of hardbottom reef habitat will be impacted due to implementation of the TSP. As compensation for these impacts, the Corps evaluated nine potential mitigation alternatives to offset unavoidable impacts to reefs and hardbottom habitats. Of those nine alternatives, four were found to be feasible and subjected to an Incremental Cost Analysis. Only one preferred alternative was determined to be cost-effective.

Where restoration and enhancement of reef resources are not available for use as mitigation, hardbottom creation has traditionally been offered (in this geographic area and where similar habitats are affected) as compensation for impacted habitats and lost ecosystem functions. The preferred alternative consists of the following:

1. Creation of approximately 12.57 acres of high-profile, artificial reef habitat to mitigate for the direct removal of approximately 10.10 acres of complex, high-profile, linear and spur/groove reef habitat; and
2. Creation of 6.92 acres of low-profile hardbottom to mitigate for the direct removal of approximately 5.07 acres of less complex, low-profile hardbottom habitat (colonized pavement).

Based on pre- and postconstruction monitoring, additional mitigation may be provided due to any detectable, incidental, direct impacts of dredging equipment and indirect impacts on hardbottom habitats due to turbidity and sedimentation.

For the preferred alternative for reef/hardbottom mitigation, the configuration of artificial reef materials will resemble, in profile and in functionality, to the maximum extent practicable, those habitats impacted. Since new reef impacts would take place at water depths of approximately 40 to 45 feet (middle reef terrace) and 50 to 55 feet (outer reef terrace) for the proposed channel expansion, the Corps has suggested these two depth zones be used as mitigation sites to achieve in-kind mitigation. The use of in-kind mitigation immediately adjacent to the impact site is one of the major benefits to this mitigation alternative. Also, the amount of high-relief reef and low-relief hardbottom could be created in proportion to the impacted sites, unlike many of the other mitigation options examined by the Corps. The Corps examined the mitigation reefs associated with the Port of Miami expansion in 1993 (the last deepwater port expansion with mitigation creation available for assessment) to determine if the mitigation reefs provided similar habitats, species assemblages, and functions as the impact area. After 7 years, it was determined the mitigation reefs (without any transplants of corals to the mitigation reef) did provide similar habitats, species assemblages, and functions. Other benefits of this mitigation option include the relative stability (on the seafloor) of quarried or dredged limestone/rock; relative ease of construction; and relative low cost.

The preferred alternative involves the deployment of limestone that has either been quarried and transported to the mitigation area, or dredged from the channel construction areas. The piles will be configured into rows that are parallel to the existing reef tracts. Two layers of boulders will comprise these piles, given a vertical dimension of approximately 6 to 8 feet of relief. Low-relief areas will comprise only one layer of boulders. Similar structures will be constructed near the Port of Miami in 2013. Based on outcomes from that effort, the Corps will be able to improve on design and material specifications for Port Project mitigation.

The interval required to reach substantial functional productivity of this alternative is estimated to be 30 to 50 years. However, with the transplantation of corals from the impact site to the rock reef infrastructure, the interval may be shortened to 23 to 30 years. As proposed, coral colonies greater than 4 inches in diameter (up to 12,235 colonies) and free of disease and boring sponge would be translocated from the impact area to the mitigation sites, which would be prepared in advance of dredging.

The total estimated cost for this alternative, including the cost of coral translocation, is estimated at \$20.13M.

The NOAA Fisheries, Southeast Regional Office, a cooperating agency with the Corps for development of the EIS, independently estimated that the TSP would impact 137.83 acres of coral, coral reef, and hardbottom (20.34 acres of coral reef in the channel and 117.49 acres of coral reef located outside the channel). In May 2013, NOAA Fisheries recommended that the Corps consider mitigating these impacts by propagating coral colonies at in-water and land-based nurseries and then outplanting the colonies to suitable recipient sites in Broward County's offshore waters. NOAA Fisheries estimated that this approach would require approximately 20 years to complete and would cost approximately \$35.6M to \$42.3M (including risk contingencies).

NOAA Fisheries' recommendation is based on successful coral propagation and enhancement programs in Atlantic and Caribbean waters. Scientific based practices for nursery propagation, outplanting and monitoring have been developed and used by coral nursery managers in the Florida Keys, Broward County, Puerto Rico, U.S. Virgin Islands, and other Caribbean islands to reproduce *Acropora* spp. asexually. Typically, small fragments less than 2 inches in diameter are collected from the reef and held in an underwater or tank-based nursery environment through their juvenile life-stage. Offshore nurseries are sited based on a number of factors, including: habitat feasibility, water quality conditions, potential for future impacts, and permitting status and considerations. Once the stock nursery population is established, no more coral is collected from natural reef communities. The physical and genetic origin of each coral is tracked from fragment collection to ensure that both nursery and outplanting operations are done in a scientifically responsible manner. Regular maintenance is performed on nursery structures and the corals themselves to ensure all are free of coral competitors and predators. Once coral fragments have grown to a size where the probability of survival on natural reefs has increased to an acceptable level (this usually requires 12 to 18 months), the corals are outplanted. Decisions regarding which species to propagate and outplant, and the relative percent-cover, or relative population densities among all species, would be based on findings from the most recent coral restoration studies, historical survey data, and results of ongoing monitoring throughout the project area. Additionally, outplant recipient sites would be selected using a strategy that maximizes likelihood of outplant survival while minimizing risk from natural and human disturbances.

Using "resource-to-resource" equivalency analysis, NOAA Fisheries estimated that 195,000 to 250,000 corals need to be outplanted from nurseries to offset the impacts to coral from expanding the OEC. These costs are reflected in the budget for this alternative. In addition to eventually establishing those colonies on recipient sites, NOAA Fisheries also assumes that additional coral translocation will occur as an impact minimization measure (such costs are not included in the budget for this mitigation alternative). These include the following:

1. Relocation of all corals listed under the Act from impact areas, regardless of size;
2. Relocation of a subset of massive corals and all corals proposed to be listed under the Act that are 2 inches in diameter or larger; and
3. Relocation of all other corals greater than 4 inches in diameter.

The proposed coral propagation and outplanting program is based on existing NOAA Fisheries coral recovery programs that support the implementation of projects such as this in partnership with local resource agencies (*e.g.*, Florida Department of Environmental Protection [DEP]), academic institutions (*e.g.*, Nova Southeastern University Oceanographic Center [NSUOC]), and other coral restoration partners in Florida. One benefit of this alternative is that it is designed to maximize the chances of successful natural coral reproduction, larval transport, settling and colonization into new areas, and genetic mixing required for survival and recovery of the species. Furthermore, this proposal is consistent with the NOAA Fisheries *Acropora* Recovery Strategy (under development) and other coral conservation priorities for coral species that have been proposed to be listed under the Act. Should this alternative be selected, it will undergo full Corps review, and meet all Corps policy requirements.

In addition to NOAA Fisheries' preferred reef mitigation alternative outlined above, other discrepancies in the Corps' preferred reef mitigation alternative have been documented. Dr. Brian Walker (NSUOC) prepared a technical review of the coral reef mapping presented in the Corps' final draft EIS. In particular, he outlined discrepancies in the Corps' spatial analysis, direct/indirect impacts analysis, and data integrity. Furthermore, Dr. Walker concluded the final draft EIS did not address cumulative impacts to hardbottom reef habitat. In addition, Dr. Richard Dodge (NSUOC) prepared a technical review of the Corps' Habitat Equivalency Analysis (HEA) and summarized his comments as follows:

1. The Corps used incorrect areas of impact, including those areas directly impacted below the 57-foot dredging depth;
2. The Corps used an inappropriate zero percent discount rate in its "modified" HEA. The HEA is an economic model and not intended to be used with a zero discount rate;
3. The Corps' choice of mitigation using boulders with coral transplants will not provide services upon maturity equivalent to those of the natural reef;
4. The HEA inputs and results in Appendix E2 of the Corps' final draft EIS are not the same as those of the Cost Analysis;
5. Many of the final draft EIS HEA input parameters used by the Corps are not supported by the best available science;
6. The inputs chosen by the Corps for their HEAs underestimate the amount of mitigation required;
7. An Alternate HEA has been developed using corrected direct impact areas for the outer and middle reefs to include the area below 57 feet, 3 percent discount rate and corrected equivalence that boulders upon maturity reach 50 percent of services of the natural reef;
8. The Corps' final draft EIS HEA for Scenario 2 in Appendix E Cost Analysis E2 of the Corps' final draft EIS, requires 32 acres less mitigation than the more correct Alternate HEA;
9. Corps project mitigation costs are significantly underestimated using the underestimated mitigation amount;
10. There is no justification given for using a much smaller figure concerning the cost per acre of boulders with transplants outlined in Table 9 of the Cost Estimate;
11. The Corps' plan lacks input from their independent technical review performed by Battelle Memorial Institute;
12. The NOAA Fisheries recommended mitigation program is scientifically valid and preferred;
13. The NOAA Fisheries recommended mitigation program is more cost efficient than the Corps version, had the Corps calculated their HEA with correct inputs; and
14. The NOAA Fisheries should be given responsibility for impact analysis, determination of mitigation type and amount, and implementation of the resultant program.

Based on the discrepancies outlined above, the Service recommends the Corps mitigate in concert with the NOAA Fisheries' preferred reef mitigation alternative plan, if the plan is found to be legally sufficient, in order to resolve these issues and provide maximum protection of all fish and wildlife resources.

THREATENED AND ENDANGERED SPECIES

The Corps determined that the project "may affect, but is not likely to adversely affect" the federally endangered West Indian manatee (*Trichechus manatus*), endangered American crocodile (*Crocodylus acutus*), endangered green sea turtle (*Chelonia mydas*), threatened loggerhead sea turtle (*Caretta caretta*), endangered Kemp's ridley sea turtle (*Lepidochelys kempii*), endangered hawksbill sea turtle (*Eretmochelys imbricata*), and endangered leatherback sea turtle (*Dermochelys coriacea*).

American crocodile

The American crocodile is a State and federally listed species. The current range of the species in the southeastern United States includes coastal and estuarine habitats in the extreme southern Florida peninsula, including Broward County. Females nest primarily on northern Key Largo and from Florida Bay to Turkey Point. Nesting begins in March and extends until late April or early May. Approximately 90 days following fertilization, eggs are buried in sand or marl nests adjacent to deep water. Adult crocodiles feed at night on schooling fish in creeks, open water, and deep channels, and are also known to eat crabs, raccoons, and water birds. At least one crocodile is known to occur within WLP and one other may be present (Ricardo Zambrano, FWC, email, November 7, 2003). However, nesting has not been confirmed in WLP.

The Corps has determined the proposed expansion and deepening of the Port Everglades Harbor as described in the TSP "may affect, but is not likely to adversely affect" the endangered American crocodile. Possible adverse effects to this species during construction include injury, mortality, or harassment, which may affect the life history of these species as a result of dredging and/or blasting activities.

The TSP includes implementation of protection measures designed to minimize possible adverse effects to frequently observed listed species such as the West Indian manatee and sea turtles; these provisions will also protect the American crocodile. Therefore, the Service concurs with the Corps' determination as it relates to adults, hatchlings, and/or juveniles of the American crocodile during dredging or blasting operations adjacent to WLP.

Sea turtles

The Service and the NOAA Fisheries share Federal jurisdiction for sea turtles under the Act. The Service has the responsibility for sea turtles on the nesting beaches and the NOAA Fisheries has jurisdiction for sea turtles in the marine environment. Our analysis will only address activities that may impact nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. NOAA Fisheries will assess and consult with the Corps concerning potential impacts to sea turtles in the marine environment. For further information on Act compliance with the NOAA Fisheries, please contact Ms. Cathy Tortorici, Chief of the

Interagency Cooperation Branch, by e-mail at cathy.tortorici@noaa.gov or by phone at 727-209-5953. In addition, the Corps will assess and consult with the NOAA Fisheries concerning potential impacts to foraging and swimming sea turtles, and all other marine species under their jurisdiction within the action area.

Beaches along John U. Lloyd State Recreational Area provide nesting habitat for federally listed sea turtles. In addition, other resources comprise important habitats for sea turtles. Removal of sections of hardbottom, reef, and seagrass habitats will eliminate potential foraging habitat for juvenile and adult sea turtles and refugia for hatchlings. Also, dredge activities and associated disturbances (noise, lights, etc.) offshore may interrupt the movement of turtles swimming toward or away from nesting beaches to the north or south. Specifically, the highest potential impact to sea turtles may result from the use of explosives to break/dislodge rock substrates in offshore channels. Threshold lethal pressures for sea turtles are probably similar to those of marine mammals (Corps 2000). Therefore, sea turtles in the immediate vicinity of any detonation site would likely be killed, and individuals existing within 400-600 feet of the blast would likely suffer injury.

Another possible element of the action that may affect sea turtles is the presence of light and/or noise from construction/dredging vessels anchored offshore. These factors may interrupt the movement of adult, nesting, female sea turtles swimming toward or away from nesting beaches, and may cause disorientation of hatchlings following emergence. Artificial lighting can be detrimental to sea turtles in several ways. Field observations have shown reduced sea turtle nesting on lighted beaches. Adult females rely on visual brightness cues to find their way back to the ocean after nesting and those turtles that nest on lighted beaches may be disoriented by artificial lights and have difficulty finding their way back to the ocean. Beachfront lighting has an even more profound effect on hatchling sea turtles. Under natural conditions, hatchlings, which typically emerge from nests at night, move toward the brightest, most open horizon, which is over the ocean. However, when bright light sources are visible on the beach, they attract hatchlings in the wrong direction, resulting in an increased risk of death or injury because they are more vulnerable to predators, dehydration, entrapment in debris or vegetation, and exhaustion. In addition, artificial lights often lure hatchlings or adult sea turtles onto roadways and parking lots where they are vulnerable to car strikes. However, since Port Everglades Harbor is an active facility, offshore lighting is not an unusual feature of the area, and the Port Project should not appreciably change the ambient conditions of nesting areas in the vicinity of the action. That said, the Corps will require all lighting aboard dredges and dredge support vessels operating within 3 nautical miles of sea turtle nesting beaches, be limited to the minimal lighting necessary to comply with U.S. Coast Guard and OSHA requirements. All non-essential lighting on dredges and support vessels shall be minimized through reduction, shielding, and appropriate placement of lights to reduce potential disorientation effects on nesting sea turtles approaching the nesting beaches and sea turtle hatchlings heading seaward.

The Service previously concurred with the Corps' determination for sea turtles (March 31, 2005) because no adverse direct or indirect impacts to sea turtle nesting habitat due to dredging operations are anticipated for the TSP. In addition, the Corps agreed to incorporate and implement the sea turtle conditions outlined in DEP Permit No. 0220509-007-JM.

West Indian manatee

The federally endangered West Indian manatee is found from coastal areas of Beaufort, North Carolina through Florida and the Gulf of Mexico. Manatees frequently inhabit shallow areas where seagrasses are present and are commonly found in protected lagoons and freshwater systems. In winter, they frequently move into areas where water temperatures are mitigated by spring-fed streams or power-generation plant effluent, such as the Florida Power & Light Company (FP&L) power plant in Fort Lauderdale. In general, very few manatees are present in the offshore waters from November through April; however, during the remainder of the year, manatees occasionally use open ocean passages to travel between favored habitats.

The West Indian manatee is protected under the Act and the Marine Mammal Protection Act of 1972. The State of Florida provided further protection in 1978 by passing the Florida Marine Sanctuary Act, designating the State as a manatee sanctuary, and providing signage and speed zones in Florida's waterways. Though there are not any areas within Broward County that are designated as Critical Habitat for the West Indian manatee, the waterways in Broward County support permanent and transient manatee populations. Some waterways serve as important warm water refugia and calving areas, particularly in the vicinity of the Port and the FP&L power plant.

Surveys indicate that, during winter months when temperatures decline, manatees from north and south of Port Everglades Harbor migrate to canals associated with the FP&L power plant. As many as 290 manatees have been observed near the power plant on a single day (Laist and Reynolds 2005).

Mezich (2001) hypothesizes manatee preference may be changing as recent years have shown a decrease in the number of animals using the Port power plant and an increase in the number of animals using the Fort Lauderdale plant located west of the Port. A review of the data from FP&L reports (Reynolds 2005, 2006, 2007, 2009, 2010, 2011) appears to support this belief. The growth in usage of the Fort Lauderdale plant may also be attributable to its more consistent releases of warm water and isolated location with less human disturbance than the Port Everglades plant site (Laist and Reynolds 2005).

Deutsch et al. (2003) noted the manatees that utilize the Port power plant during winter cold spells exhibit three trends in movement to access forage. As previously stated, some move south into Biscayne Bay, some move north into Lake Worth Lagoon, and some move further west toward the Fort Lauderdale FP&L plant to access freshwater forage and mangroves. Manatees typically demonstrate a diurnal feeding pattern when at the power plants. They spend the mornings into the early afternoons in the warm discharge waters at the plant, and then move away from the plant to forage since the sun has warmed the surrounding waters. As air temperatures (and subsequently water temperatures) drop, they return to the power plant discharges' thermal refuges.

During the summer months when the water warms, manatees return to the counties to the north and south to forage and reproduce. However, telemetry and aerial surveys confirm manatees are present within Broward County all year (Deutsch 2000). Broward County conducts aerial

surveys by helicopter flights throughout the year. Recent surveys conducted between 2004 and April 2011 have documented between 8 and 455 manatees in all waterways of Broward County (Broward County 2011).

FP&L is in the process of temporarily ceasing operations at the current Port power plant. Demolition of the current plant is expected to begin in 2013 and construction of the new plant is expected between 2014 and 2016, with the plant online and operational in 2016. FP&L has been preparing, with the Service and FWC, an environmental and biological monitoring plan. During construction, FP&L will maintain an "Interim Warm-Water Refuge" (IWWR), using the current warm-water discharge system, during the winter months beginning with the discontinuation of operations at the existing Port power plant and continuing until the new unit is operational. Implementation of the IWWR should result in continued manatee use of the Port Everglades plant and potentially no decrease in protection measures associated with the Port expansion project (*i.e.*, standard manatee protection measures and cessation of confined underwater rock blasting during manatee congregation periods).

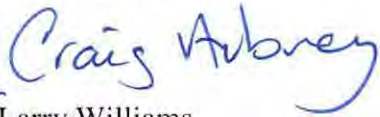
The Service concurred on March 31, 2005, with the Corps' determination for the West Indian manatee because the Corps agreed to incorporate and implement the following:

1. The Standard Manatee Conditions for In-Water-Work (FWC 2011), all manatee protection measures outlined in the final draft EIS, manatee conservation measures from the Miami Harbor Phase III project, and all manatee conditions outlined in the DEP Permit No. 0220509-007-JM;
2. The same blasting protection measures and monitoring procedures developed for the Miami Harbor Phase III project, known as the Navy Diver Protocol, plus an additional 500 feet to the safety zone. Furthermore, the Corps agreed to revise the blasting protection measures should the results of the Miami Harbor Phase III indicate the need based on input from State, Federal, and local governmental agencies; and
3. Blasting activities will be avoided during the winter months (November 15 to March 15) when manatee populations are expected to be at their highest concentration in the action area. Other dredging and construction activities may take place inside the Port Everglades Harbor during this time period, but confined underwater (CU) blasting will not be utilized during this period.

The Service recommends the Corps provide details concerning the wildlife protection measures to be implemented in the test blast program and how these measures may vary compare to all other CU blasting activities.

Thank you for your cooperation in the effort to conserve fish and wildlife resources. Should you have additional questions or require clarification regarding this letter, please contact Jeff Howe at 772-469-4283.

Sincerely yours,


for Larry Williams

Field Supervisor
South Florida Ecological Services Office

cc: electronic only

Corps, Jacksonville, Florida (Terri Jordan-Sellers)

DEP, Tallahassee, Florida (Lanie Edwards)

EPA, West Palm Beach, Florida (Ron Miedema)

FWC, Tallahassee, Florida (Kellie Youmans)

NOAA Fisheries, Palm Beach Gardens, Florida (Jocelyn Karazsia)

NOAA Fisheries, Fort Lauderdale, Florida (Kelly Logan)

Service, Jacksonville, Florida (Jim Valade)

USGS, Gainesville, Florida (Susan Walls)

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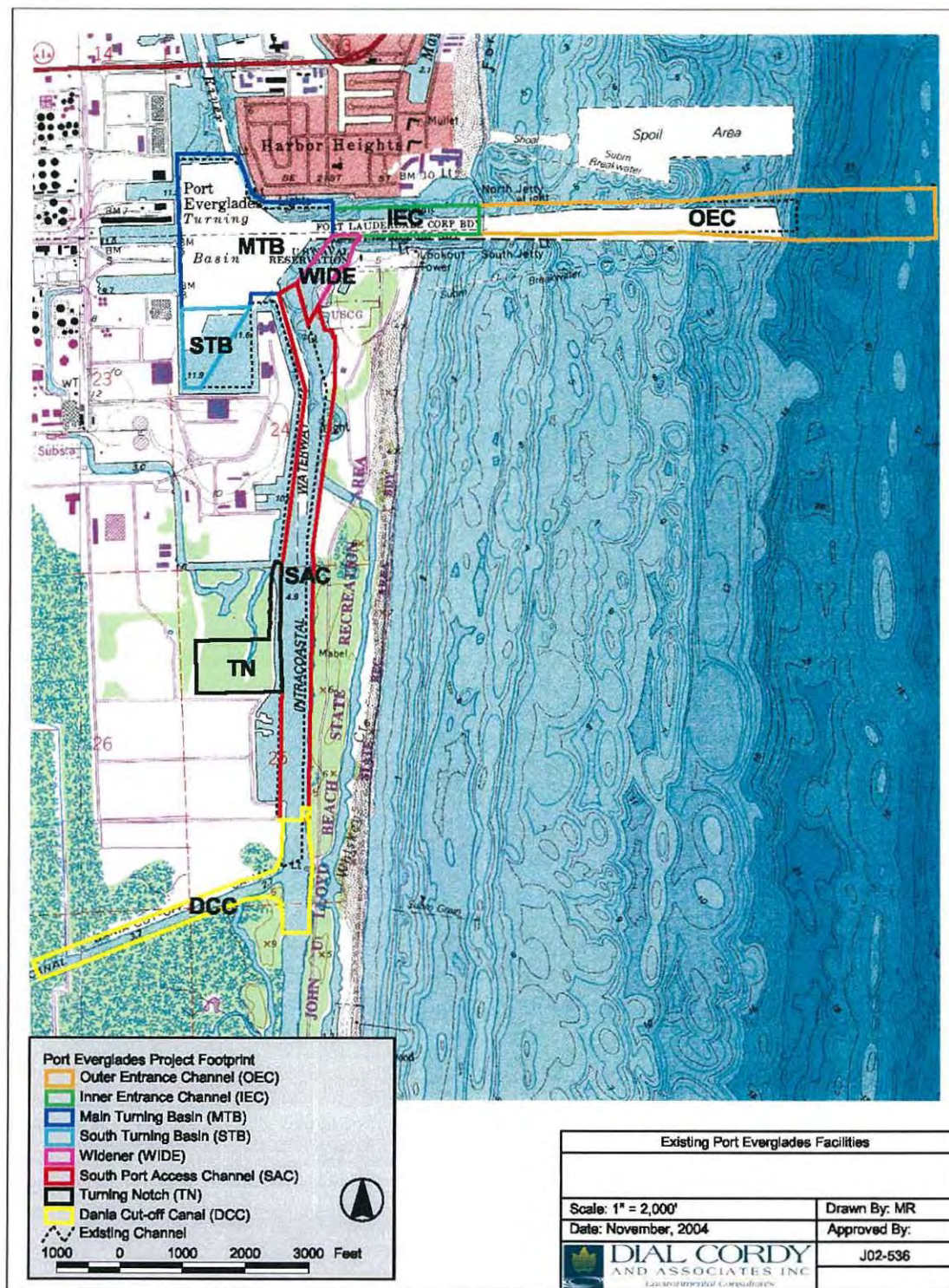


Figure 1. The Port Everglades Harbor navigation project proposed in the 2005 FWCA report.



Figure 2. The proposed Port Everglades Harbor navigation project outlined in the 2013, draft Feasibility Report and Environmental Impact Statement.

From: Jeffrey_Howe@fws.gov
To: [Jordan-Sellers, Terri SAJ](#)
Subject: RE: Port Everglades CAR (UNCLASSIFIED)
Date: Monday, November 28, 2011 12:02:34 PM

Hello Terri:

To be honest with you if I had access to the DEIS that is currently in review, I really wouldn't have the time to review and start on our updated CAR. Consequently, could you plan on sending me the finalized DEIS when available in early 2012?

Thanks,

Jeff Howe
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
South Florida Ecological Services Office
1339 20th Street
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(772) 562-3909 x.283
(772) 562-4288 FAX
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"Jordan-Sellers, Terri SAJ" <Terri.Jordan-Sellers@usace.army.mil>

11/16/2011 11:17 AM To
"Jeffrey_Howe@fws.gov" <Jeffrey_Howe@fws.gov>
cc
"Craig_Aubrey@fws.gov" <Craig_Aubrey@fws.gov>, "Trish_Adams@fws.gov" <Trish_Adams@fws.gov>
Subject
RE: Port Everglades CAR (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Yes - I think we can do that. Would it be helpful to give you access to the DEIS that is in higher authority review so that you could start looking at it now?

-----Original Message-----

From: Jeffrey_Howe@fws.gov [mailto:Jeffrey_Howe@fws.gov]
Sent: Wednesday, November 16, 2011 7:19 AM
To: Jordan-Sellers, Terri SAJ
Cc: Craig_Aubrey@fws.gov; Trish_Adams@fws.gov
Subject: Port Everglades CAR

Hello Terri:

Personally, I don't have any desire to have our March 31, 2005, draft CAR represent the Service's position concerning the above referenced project based on project changes since the draft CAR was written. Could we plan on providing the Corps with an updated final CAR based on the latest DEIS due in January 2012? If this is acceptable, could this be noted in the DEIS?

Thanks,

Jeff Howe
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
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Classification: UNCLASSIFIED
Caveats: NONE



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
236 13th Avenue South
St. Petersburg, Florida 33701

May 20, 2005

James J. Slack, Field Supervisor
South Florida Ecological Services Office
U.S. Fish and Wildlife Service
1339 20th Street
Vero Beach, Florida 32960

Dear Mr. Slack:

The National Marine Fisheries Service (NMFS) has reviewed the draft Fish and Wildlife Coordination Act Report (CAR) for the Port Everglades Navigation Project, prepared pursuant to the Fish and Wildlife Coordination Act and the Endangered Species Act and provided by the Fish and Wildlife Service (FWS). Port Everglades (Port) is one of the major port complexes along the east coast of the U.S. The Port, located approximately 27 nautical miles north of Miami, is accessible via Port Everglades Inlet and the Atlantic Intracoastal Waterway (AIWW) in Broward County, Florida. Broward County's Port Everglades Department requested that the Army Corps of Engineers (COE) study the feasibility of modifying portions of Port Everglades Harbor to improve the federal navigation system of channels. The draft CAR evaluates the likely effects of the proposed harbor expansion on fish and wildlife resources.

According to the information provided, the COE proposes to widen and deepen most of the major channels and basins within Port Everglades to accommodate longer, wider, and deeper-draft commercial vessels and meet the changes in the industry standard. Although not emphasized in the draft CAR, NMFS has been advised by the COE that the expansion project is primarily proposed to accommodate post-Panamax vessels. Modifications to the federal system of channels under the Recommended Plan include: (1) deepening the harbor turning basins and channels; (2) widening the Dania Cutoff Canal (north shore); (3) widening portions of the AIWW (east shore and south of entrance channel); and (4) extending and widening the eastern section of the Outer Entrance Channel by 2,200 feet and 300 feet, respectively. Construction would be accomplished through a combination of traditional dredging methods and the use of explosives in inshore and offshore locations. Unconsolidated and consolidated material generated during dredging would be deposited within offshore and/or upland disposal sites.

The proposed navigational improvements to Port Everglades Harbor would significantly impact habitats utilized by fish and wildlife. The COE estimates that a total of 5.0 acres of seagrass, 11.55 acres of mangroves (8.48 acres currently held in a conservation easement), 14.86 acres of



low relief hardbottom, 10.82 acres of high relief coral reef, and 20.09 acres of previously dredged rock/rubble habitat would be adversely affected as a result of the expansion of Port Everglades. Indirect impacts to fish and wildlife resources may include the resuspension of fine sediments and potential resuspension of contaminants. Lethal and sub-lethal effects on marine mammals, sea turtles, and marine fisheries may also occur due to the loss of habitat and proposed blasting. At the February 17, 2005, interagency meeting, NMFS was advised by the COE that an additional 7.14 acres of high relief offshore reef and 6.37 acres of low relief reef could be eliminated in connection with anchors and cables used to position construction equipment and vessels.

As compensation for impacts to marine and estuarine habitats, the COE has proposed to: (1) mitigate for the direct impacts to 5.0 acres of seagrass through the removal of spoil islands in West Lake Park and to create 8.0 acres of seagrass recruitment habitat; (2) mitigate for the removal of 11.55 acres of mature mangrove habitat, including the 8.48 acres currently held in a conservation easement, at a 1:1 mitigation ratio through the creation of 11.55 acres of mangrove habitat within West Lake Park; (3) mitigate for the removal of 10.82 acres of high relief coral reef habitat at a ratio of 2:1 through the creation of 19.36 acres of high complexity, high relief artificial reef habitat; and (4) mitigate for the 14.89 acres of impact to low relief hardbottom habitat at a ratio of 1.3:1 through the creation of 19.36 acres of low complexity, low relief artificial hardbottom habitat. The COE has not proposed compensation for removal of the biotic communities, such as soft corals, sponges, and hard corals, which have colonized the existing channel and rock/rubble bottom since the last dredging event.

The CAR provides a qualitative assessment of the habitats proposed for impact associated with the Port Everglades channel and harbor improvements. In general, we support the recommendations provided in the CAR on behalf of the FWS. However, the NMFS opines that it is premature to evaluate the effect of this project and develop detailed recommendations given that avoidance measures and alternatives including the no action alternative and the Port of Miami Expansion Project as an alternative have not been duly considered. The impacts are significant and would permanently eliminate over 40 acres of essential fish habitat (EFH)/habitat areas of particular concern (HAPC) utilized by various life stages of federally managed species. Further, the NMFS is concerned that the impacts do not justify need for the project, especially when considering that the Port of Miami, located approximately 27 nautical miles to the south in Miami-Dade County, Florida, will commence construction late May/early June 2005 to expand and deepen port facilities to accommodate post-Panamax vessels. The need for two ports within 30 miles of one another and for use by post-Panamax vessels has not been demonstrated, nor has it been evaluated in the feasibility study (Terri Jordan, COE, pers. comm. 2005). The economic analysis prepared for the feasibility study considers the need for Port Everglades expansion independent of the Port of Miami expansion (Bob King, COE, pers. comm., 2005). Currently, there are no ports along the U.S. east coast that can accommodate post-Panamax vessels; however the Port of New York/New Jersey is undergoing a dredging project to accommodate these vessels.

The following comments are primarily based on information presented in the CAR, but also consider information presented at interagency meetings including the February 17, 2005, and May 4, 2005, meetings. Based on the limited available information provided to date from the COE, we emphasize that the following comments are not intended to be comprehensive or final. These comments are primarily with regard to marine and estuarine habitat impacts, i.e., those habitats designated EFH-HAPC, pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). Other issues regarding threatened and endangered species, should be coordinated with the NMFS Protected Resources Division at the letterhead address.

Specific comments

Pages 10-11. *Nearshore Hardbottom Reefs*. This section omits reference to important habitat functions of this habitat type. Nearshore hardbottom communities in this area have been characterized by Goldberg (1973a) and Nelson (1989). Nearshore hardbottom habitats serve as nursery habitats for coastal fish species, for example by providing structural support, food, and shelter for post-settlement fishes (Lindeman and Snyder 1999). Further, it should be noted that nearshore hardbottom habitats provide structure for all types of corals, including many hermatypic species that are near their northernmost range (SAFMC 1998).

Pages 11-12. *Ichthyofauna*. In the absence of reviewing the 2001 fish survey protocol and findings, NMFS is concerned that the results presented in the CAR may represent a gross underestimate of the managed species present on the nearshore hardbottom reefs. This habitat type is utilized by newly settled species. Methods used during the 2001 survey to identify post-settlement and juvenile life stage fishes and timing of the survey should be addressed in the CAR.

Pages 12-13. *Essential Fish Habitat*. Overall, this section should be rewritten, including the first paragraph, which describes the EFH mandate. Many statements in this section are inaccurate. For example, contrary to what is stated in the draft CAR, the *littoral zone* and *sublittoral zone* are not categories of EFH.

State of Florida listed species (e.g., snook) should not be addressed in this section. Although the NMFS considers State of Florida listed species as aquatic resources of national importance (ARNI), in accordance with Section 906(e)(1) of the Water Resources Development Act of 1986 (PL 99-602), EFH has not been designated for each life stage history. Inclusion of State of Florida listed species generates confusion and could potentially dilute their significance in the final CAR.

The coral component of the EFH section is inadequate. Although NMFS acknowledges that the CAR is not meant to serve as a comprehensive literature review, only one generic sentence is provided to characterize the corals in this area. Several key publications have been omitted from this section including, but not limited to Goldberg 1973; SAFMC 1998; Vargas et al., 2003; and Moyer et al., 2003.

In general, NMFS does not concur with the mitigation components of the EFH section. For example, the draft CAR states that mitigation will not be required for "dredging softbottom habitats . . . or habitats with rubble substrates." If rubble areas support corals that are within the size class for successful relocation, the NMFS will recommend that these corals be removed and transplanted to suitable areas.

Further, this section does not acknowledge the water column as EFH. The marine water column has been designated as EFH due to its importance as the medium of transport for nutrients and migrating organisms between estuarine systems and the open ocean. Impacts to this category of EFH would occur through dredging-induced increases in turbidity and sediment transport.

We strongly encourage the FWS and/or Dial Cordy and Associates (contractor, CAR author) to contact our office for clarification on the habitats types that are designated EFH, the EFH mandate, and the literature available to characterize EFH in this region. We are enclosing an EFH guidance document that was prepared by the NMFS Southeast Regional Office. This document provides an overview of the EFH provisions of the Magnuson-Stevens Act and implementing rules.

Page 16. Dredged material disposal. The draft CAR states that dredged material disposal would occur in upland disposal sites, however, NMFS has been advised by the COE that offshore disposal is also likely. While effects associated with potential offshore disposal have been evaluated by the Environmental Protection Agency through National Environmental Policy Act (NEPA) procedures, this activity should also be described in the CAR.

Pages 42-46. FWS Recommendations. As stated above, NMFS does not believe that the adequate avoidance and minimization measures have been demonstrated and it is premature to evaluate the effect of the project, as currently proposed, and develop detailed recommendations. The NMFS recommends that the COE explore alternatives including the no action alternative and the Port of Miami Expansion Project, as alternatives.

Assuming that the federal sequential mitigation requirements and NEPA procedures may be adequately addressed, we provide the following comments. Unless otherwise noted below, NMFS concurs with the recommendations provided in the draft CAR. We especially support the design modification recommendations and the recommendation (#7) to seek alternative hardbottom and coral reef mitigation options through the multi-disciplinary Port Everglades Reef Group (PERG). We also support the recommendation (#20) to further avoid direct impacts to seagrasses and to increase the mitigation ratio. Recommendation #15 which call for conduct biological monitoring of managed fish and protected species is also supported. Other specific comments are provided below.

Recommendation #2: The FWS recommends that impacts to mangrove wetlands that are under a conservation easement should be offset using a 3:1 (impact/replacement) ratio. NMFS recommends that a much higher mitigation ratio be applied, i.e., not less than 10:1.

Recommendation #6: The FWS recommends that hard corals (one foot in diameter or greater) within the dredging footprint should be relocated. We note that Broward County, in concert with NOVA Southeastern University, has experienced recent and replicated success with coral relocation associated with the Broward County Shore Protection Project (SPP). In connection with that project, corals 15 centimeters in diameter or greater were salvaged and relocated. Therefore, the NMFS recommends that all stony coral colonies (Order Scleractinia) having a living tissue diameter (long axis of continuous living tissue) of 15 cm or greater, be transplanted in order to speed recovery of ecological function and diversity.

Recommendation #8: The NMFS strongly supports this recommendation, which advises that lessons learned from the Broward County SPP and the Key West Harbor Dredging Project be applied to this project. The NMFS opines that the interagency coordination efforts associated with the Key West project are directly related to that project's success and we would like to participate in a similar effort with the Port Everglades project. We further recommend that biological monitoring (i.e., coral sedimentation monitoring) that was developed for the Broward County SPP be applied to this project as well.

Recommendation #23: The FWS recommends that the COE create a 51-acre mitigation reef to compensate for direct impacts to high and low relief reef. As stated above, at this time the NMFS prefers to seek alternative hardbottom and coral reef mitigation options through the multi-disciplinary PERG.

Editorial comments:

Page i, first paragraph. The first sentence references the "Seaport Department of Miami-Dade County" instead of the "Broward County's Port Everglades Department."

Page i, second and third paragraphs. The first sentences reference "Miami Harbor" instead of "Port Everglades Harbor."

Page 12, first paragraph. It is not clear what is meant by the following sentence: "All of these species are listed in SAFMC (1998a)."

We appreciate the opportunity to provide these comments. The NMFS re-iterates that we strongly encourage the FWS and/or Dial Cordy and Associates (contractor, CAR author) to contact our office for clarification on the habitats types that are designated EFH, the EFH mandate, and the literature available to characterize EFH in this region. Related correspondence

Literature Cited:

- Goldberg, W.M. 1973. The ecology of the coral-octocoral communities off the southeast Florida coast: Geomorphology, species composition, and zonation. *Bulletin of Marine Science* 23: 465-488.
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United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960



April 5, 2005

Dennis Barnett
Acting Chief, Planning Division
U.S. Army Corps of Engineers
701 San Marco Boulevard, Room 372
Jacksonville, Florida 32207-8175

Dear Mr. Barnett:

In accordance with the Fiscal Year 2003 Transfer Fund Agreement between the Fish and Wildlife Service (Service) and the U.S. Army Corps of Engineers, Jacksonville District, enclosed is the Draft Fish and Wildlife Coordination Act (FWCA) Report for the Port Everglades Navigation Project, Broward County, Florida. This draft report, provided in accordance with the FWCA of 1958, as amended (48 Stat.401; 16 U.S.C. 661 *et seq.*) and under the provisions of section 7 of the Endangered Species Act of 1973, as amended (87 Stat. 884; 16 U.S.C. 1531 *et seq.*), has been prepared to provide an evaluation of environmental effects of navigation improvements to Port Everglades.

By copy of this letter, the Service is soliciting comments within 45 days from the Florida Fish and Wildlife Conservation Commission and the National Marine Fisheries Service. Comments by both agencies will be considered by the Service in preparing the final FWCA report, and copies of the comments will be included as appendices to the final report, which will constitute the Secretary of the Interior's views and recommendations for this project, in accordance with section 2(b) of the FWCA.

Please contact Trish Adams at 772-562-3909, extension 232, regarding the findings and recommendations contained in this draft report.

Sincerely yours,

James J. Slack
Field Supervisor
South Florida Ecological Services Office

Enclosure

TAKE PRIDE[®]
IN AMERICA 

Dennis Barnett

Page 2

cc: w/enclosure

FWC, Tallahassee, Florida (Robbin Trindell)

FWC, Vero Beach, Florida

NOAA Fisheries, Habitat Conservation Division, Miami, Florida

NOAA Fisheries, Protected Resources Division, St. Petersburg, Florida

**Port Everglades Navigation Project
Fish & Wildlife Coordination Act Report**

DRAFT



Prepared for

**U.S. Fish and Wildlife Service
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960**

by

**Dial Cordy and Associates, Incorporated
490 Osceola Avenue
Jacksonville Beach, Florida 32250**

March 31, 2005

EXECUTIVE SUMMARY

Broward County's Port Everglades Department requested that the U.S. Army Corps of Engineers (Corps) study the feasibility of modifying portions of Port Everglades Harbor to improve the Federal navigation system of channels. This draft Fish and Wildlife Coordination Act (FWCA) Report evaluates the likely effects of the proposed harbor expansion project on fish and wildlife resources, including federally threatened and endangered species, and is submitted in accordance with provisions of the FWCA of 1958, as amended (48 Stat. 401; 16 U.S.C. 661 *et seq.*) and the Endangered Species Act (ESA) of 1973, as amended (87 Stat. 884; 16 U.S.C. 1531 *et seq.*).

Port Everglades (Port) is one of the major port complexes along the east coast of the United States. It is located adjacent to the Cities of Dania and Fort Lauderdale, Broward County, Florida, approximately 27 nautical miles north of Miami. The Port is accessible from the Atlantic Ocean through Port Everglades Inlet and the Atlantic Intracoastal Waterway (AIW). The mainland and barrier islands surrounding the Port Everglades are fully developed, except for John U. Lloyd State Recreation Area and West Lake Park. Though the majority of the terrestrial land surrounding the Port is developed, there are important habitats for fish and wildlife existing inside and adjacent to the project area. Terrestrial and marine habitats in the vicinity of the project area include the coastal strand, mangroves, seagrass beds, coral reefs and other hardbottom reefs, sand-bottom habitats, and rock/rubble-bottom habitats. The waters in the vicinity of Port Everglades are important for manatees, since they provide access to an important manatee calving area and a warm water refugia associated with the Florida Power and Light power plant at Fort Lauderdale.

The proposed navigational improvements to Port Everglades will impact habitats utilized by fish and wildlife populations. Modifications to the Federal system of channels under the Recommended Plan include: (1) deepening the harbor turning basins and channels; (2) widening the Dania Cutoff Canal (north shore); (3) widening portions of the AIW (east shore and south of the entrance channel), and (4) extending and widen the eastern section of the Outer Entrance Channel by 2,200 feet and 300 feet, respectively. Construction will be accomplished through a combination of traditional dredging methods and the use of explosives inshore and offshore. Unconsolidated and consolidated material generated during dredging will be deposited within approved offshore and/or upland disposal sites.

The Corps estimates that a total of 5.0 acres of seagrass, 11.55 acres of mangroves, 14.89 acres of low relief hardbottom, 10.82 acres of high relief coral reef, and 20.09 acres of previously dredged rock/rubble habitat will likely be adversely affected as a result of the expansion of Port Everglades. Indirect impacts to fish and wildlife resources may include the resuspension of fine sediments and possibly contaminants.

As compensation for the impacts to habitat, the Corps has proposed to: (1) mitigate for the direct impacts to 5.0 acres of seagrass through the removal of spoil islands in West Lake Park, and create 8 acres potential seagrass recruitment habitat; (2) mitigate for the removal of 11.55 acres of mature mangrove habitat, 8.48 acres of which are currently held in a conservation easement, at

a mitigation ratio of 1:1 through creation of 11.55 acres of mangrove habitat within West Lake Park; (3) mitigate for the removal of 10.82 acres of high relief coral reef habitat at a ratio of 2:1 through the creation of 21.64 acres of high complexity, high relief artificial reef habitat; and (4) mitigate for the 14.89 acre of impact to low relief hardbottom habitat at a ratio of 1.3:1 through the creation of 19.36 acre of low complexity, low relief artificial hardbottom habitat. The Corps has not proposed compensation for the removal of the biotic communities, such as soft corals, sponges, and hard corals, which have colonized within the existing channel walls and rock/rubble bottom since the last dredging event.

The Fish and Wildlife Service (Service) has provided several recommendations in this document to further minimize or avoid possible adverse effects of the harbor expansion project on fish and wildlife resources. Specifically, the Service recommends the following to adequately compensate for the temporal loss of function and value of the impacted habitats by: (1) significantly increasing the mitigation ratio (e.g., to 3:1) for mangroves if the 8.48 acres in the conservation easement can not be avoided; (2) increasing the mitigation ratio for impacted seagrass habitat from 1:1 to 3:1 for a total of 15 acres; (3) developing a Seagrass Monitoring Plan that contains success criteria that are consistent with Fonseca et al. (1998); (4) creating a 51-acre mitigation reef to compensate for direct impacts to high and low relief hardbottom reef habitat; (5) providing adequate mitigation for the temporal loss of function and value associated with the low relief hardbottom habitat located within the previously dredged channels, particularly the channel walls; and (6) continuing to seek alternative methods to mitigate for reef impacts through the Port Everglades Reef Group. In addition, the Service recommends the development of a comprehensive (pre, during, post project) environmental monitoring program to verify that project impacts occurred within the levels anticipated and to ensure that the mitigation areas are performing to a level where habitat replacement values are maintained.

The Corps has determined that the project “may affect, but is not likely to adversely affect” the federally endangered West Indian manatee (*Trichechus manatus*), endangered American crocodile (*Crocodylus acutus*), endangered green sea turtle (*Chelonia mydas*), threatened loggerhead sea turtle (*Caretta caretta*), endangered Kemp’s ridley turtle (*Lepidochelys kempii*), endangered Hawksbill sea turtle (*Eretmochelys imbricata*), endangered leatherback turtle (*Dermochelys coriacea*), threatened Johnson’s seagrass, and endangered smalltooth sawfish (*Pristis pectinata*). In addition, the Corps has determined that the following whale species may be affected during blasting activities: the endangered humpback whale (*Megaptera novaeangliae*), endangered fin whale (*Balaenoptera physalus*), endangered sei whale (*Balaenoptera borealis*), and endangered sperm whale (*Physeter macrocephalus*) which are known to occur along the Atlantic coast. Since the Corps has agreed to incorporate the *Standard Manatee Protection Construction Conditions* and implement a comprehensive blasting plan to minimize possible adverse effects to listed marine species using the standard “Navy diver” protocol plus an additional 500 foot buffer to the safety zone, the Service concurs with the Corps’ determination for the two species which fall under the jurisdiction of the Service, the West Indian manatee and the American crocodile. The Corps has initiated consultation with the National Oceanographic and Atmospheric Administration concerning the remaining listed species.

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APPENDIX A: Previous Correspondence from U.S. Fish and Wildlife Service

APPENDIX B: Functional Assessment of Mangrove Habitats

LIST OF ACRONYMS

AIW	Atlantic Intracoastal Waterway
DC&A	Dial Cordy and Associates, Incorporated
DCC	Dania Cutoff Canal
DDT	Dichloro-diphenyl-trichloroethane
DEP	Florida Department of Environmental Protection
EPA	Environmental Protection Agency
ESA	Endangered Species Act
EWRA	Estuarine Wetland Rapid Assessment Procedure
FPL	Florida Power and Light
FWC	Florida Fish and Wildlife Conservation Commission
HAPC	Habitat Areas of Particular Concern
HRHC	High Relief/High Complexity
HTRW	Hazardous, Toxic or Radioactive Waste
IEC	Inner Entrance Channel
LRLC	Low Relief/Low Complexity
MMPA	Marine Mammal Protection Act
MTB	Main Turning Basin
NMFS	National Marine Fisheries Service
NSU	Nova Southeastern University
NTB	North Turning Basin
OEC	Outer Entrance Channel
RFP	Request for Proposal
SAC	Southport Access Channel
SAV	Submerged aquatic vegetation
SQAG	Sediment Quality Assessment Guidelines
SRA	State Recreation Area
STB	South Turning Basin
TBP	Test Blast Program
TN	Turning Notch
USCG	U.S. Coast Guard

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1.0 IDENTIFICATION OF PURPOSE, SCOPE, AND AUTHORITY

The Port Everglades (Port) Feasibility Study was authorized by a House Resolution in May 1996. Congress added funding in the appropriations for fiscal year 1997 to begin the Feasibility Study. The U.S. Army Corps of Engineers (Corps) and Broward County, the local sponsor, entered into a cost sharing agreement on April 17, 1997. On June 29, 1999, the Port requested the Corps to re-scope the Feasibility Study. The Amended Study Agreement was signed on April 4, 2000, and was further amended on February 19, 2002. This draft Fish and Wildlife Coordination Act (FWCA) Report evaluates the likely effects of the proposed federal channel and harbor improvements on fish and wildlife resources and is submitted in accordance with provisions of the FWCA of 1958, as amended (48 Stat. 401; 16 U.S.C. 661 *et seq.*) and the Endangered Species Act (ESA) of 1973, as amended (87 Stat. 884; 16 U.S.C. 1531 *et seq.*).

2.0 PROJECT HISTORY AND SERVICE INVOLVEMENT

Port Everglades was initially constructed from 1925 through 1928. Although the Federal project was completed in 1984, the most recent modifications to the Port were carried out between 1984 and 1991 (Table 1). Modifications during that period included deepening and widening of the Southport Access Channel (SAC), construction of a bulkhead, and creation of the Turning Notch (TN) (Corps 1991). The Fish and Wildlife Service (Service) addressed these activities in at least two letters submitted in accordance with the ESA and the FWCA, respectively. Maintenance dredging issues were addressed by the Service in an additional letter and the Planning Aid Report, Port Everglades, Florida, Maintenance Dredging Project, both submitted under the authority of the FWCA (see Appendix A for all four documents). The Dania Cutoff Canal (DCC), part of which lies within the proposed project area, serves local drainage needs and lends access to Port Denison from the Atlantic Intracoastal Waterway (AIW). In 1985-1986, local interests dredged the canal to minus 16 feet National Geodetic Vertical Datum.

3.0 AREA SETTING

3.1 Project Location and Existing Conditions

The Port Everglades Harbor (Port) is a major seaport located on the southeast coast of Florida. It is located within the cities of Hollywood, Dania Beach and Fort Lauderdale, with immediate access to the Atlantic Ocean. The entrance of the Port is approximately 27 nautical miles (nm) north of Miami Harbor, Florida and 301nm south of Jacksonville Harbor, Florida. The existing Port Everglades Federal Navigation Project provides for an Outer Entrance Channel (OEC) which is 45 feet deep and 500 feet wide, an Inner Entrance Channel (IEC) which is 450 feet wide and 42 foot deep, a Main Turning Basin (MTB) which is 42 feet deep, a North Turning Basin (NTB) which is 31 feet deep, a South Turning Basin (STB) which is 31 to 36 feet deep, a SAC which is 390-400 feet wide and 42 feet deep, and a TN which is 42 feet deep. To the east of the Port is a barrier island that contains a U.S. Navy facility, a Nova Southeastern University facility (NSU), a U.S. Coast Guard (USCG) facility, and John U. Lloyd State Recreation Area (SRA) and its adjacent beaches. South of the Port's DCC is the West Lake Park area. West of the Port is

Federal Highway which is flanked by the Fort Lauderdale/Hollywood International Airport. North of the Port is a mixture of small craft waterways and commercial and residential development. Figure 1 shows major features located within and surrounding the project site.

3.2 Description of Study Area

3.2.1 Physical Conditions

Tides at Port Everglades are semi-diurnal (two high and two low daily). Mean tidal range in the harbor entrance and main harbor area is less than 2 feet.

Two types of currents affect Port Everglades, offshore currents and currents within the harbor itself. Offshore currents affecting Port Everglades Harbor include littoral currents, inlet related tidal currents, and strong currents resulting from the proximity of the Atlantic Gulf Stream. Currents within the harbor arise from flood and ebb tides, river outflows, and power plant discharges.

3.2.2 Geology

In the Main Harbor Area of the Port, a significant quantity of rock is present and will likely require blasting. In general, there is a wide ridge of hard massive rock in the MTB that extends in a north-south direction from the north harbor extension, through the center of the harbor, and through the south harbor extension. Based on the historic core boring drilled along the South Port Channel, it appears that the rock may be dredged by using a rock-cutting hydraulic dredge. Although it is likely that harder more massive rock could be encountered at lower elevations. In the DCC, core borings and geotechnical data are being collected and evaluated. The OEC and IEC will likely be excavated without blasting, although blasting may be required where hard rock dominates the substrate.

3.2.3 Sediment and Water Quality

The waters within the Port are designated Class III by the Florida Department of Environmental Protection (DEP). However, the waters adjacent to John U. Lloyd SRA, on the Atlantic Ocean side, are designated as Outstanding Florida Waters. Major waterways adjacent to the Port are the New River system to the north, the AIW, and the DCC to the south. In addition, there are storm water collection systems within the Port and areas west and north of the Port discharging into Port waters.

Monitoring data indicate that water quality varies on a seasonal basis, while physical parameters are influenced by freshwater run-off normally during summer. Historical chemical analyses indicate that some pesticides have been found in trace amounts. However, Port Everglades does not handle fertilizers or pesticides as a bulk cargo and it is possible that the presence of these compounds may be associated with urban run-off surrounding the Port.

Sediment constituents encountered at Port Everglades vary greatly according to core boring location and elevation. Appendix E of the Draft Feasibility Report contains detailed core boring logs and some grain-size curves. The Corps analyzed hundreds of core borings that have been drilled in and around the Port. The sponsor, Broward County, has also drilled two groups of core borings (total 36 borings) in support of this study. The majority of materials within the project area include interbedded layers of sand and rock, which are categorized as sands, silty sands, gravelly sands, weakly cemented sands, moderately cemented sands, weakly cemented sandstone and limestone, and occasional solid beds of sandstone and limestone. Softer materials on average are excavated as partially cemented sand with occasional thin (inches to a few feet) layers of solid rock. After excavation, the materials will appear as gravelly sand with occasional pockets of silt. Approximately 80 to 90 percent of the excavated material would be classified as sands.

According to the *Port Everglades Harbor Marine Protection Research and Sanctuaries Act Tier I Evaluation of Dredged Material Disposal* (Corps 2002, February 1 revision), disposal of unusable dredged materials would be on uplands. Sediments from project reaches that have been examined have not shown traces of anthropogenic contaminants that would preclude disposal of materials at upland sites. The DEP has suggested that upstream marinas and the Ft. Lauderdale-Hollywood International Airport may contribute various pollutants in sediments of the DCC. In an effort to locate additional information regarding contaminants, the Corps has contacted the following for sediment chemistry data: Broward County Department of Planning and Environmental Protection, the South Florida Water Management District, the DEP Bureau of Laboratories, the U.S. Geological Service Center for Coastal and Regional Marine Studies, and the U.S. Geological Service Miami Subdistrict for Water Resources. To date, personnel in these offices were not able to identify any sediment chemistry data for the DCC or any other reaches within the project area.

3.2.4 Land Use

Broward County is the second most populous county in the State of Florida, with over 1.5 million citizens (U.S. Census Bureau 2000). Adjacent Miami-Dade County, to the south, is the most populous (over 2 million). Port Everglades lies within the urban, eastern section of Broward County. To the east of the Port is a barrier island that contains a U.S. Navy facility, the NSU facility, a USCG facility, and John U. Lloyd SRA and adjacent beaches. South of the DCC is an undeveloped coastal system including West Lake Park. West of the Port is Federal Highway, which is flanked by the Fort Lauderdale/Hollywood International Airport. North of the Port is a mixture of small craft waterways and commercial and residential development. Dial Cordy and Associates, Incorporated (DC&A) (2001) determined current land use and biotic community cover types according to the Florida Land Use Cover Classification System (Florida Department of Transportation 1995).

4.0 FISH AND WILDLIFE RESOURCES

4.1 Biotic Communities

Habitats within the project impact area include coastal strand, mangroves, seagrasses, unvegetated softbottom, rock/rubble, high and low relief, and coral reefs.

4.1.1 Coastal Strand

The majority of coastal strand adjacent to the project area is largely developed with commercial, industrial, governmental, and educational facilities. To the north of Port Everglades Inlet, the barrier island is dominated by residential communities. South of the Inlet, the barrier island supports the USCG facility, NSU Oceanographic Center, and John U. Lloyd SRA.

Encompassing 251 acres of barrier island, John U. Lloyd SRA represents the greatest amount of continuous undeveloped barrier island in the project vicinity. Exotic vegetation such as Australian pine (*Casuarina equisetifolia*) and Brazilian pepper (*Schinus terebinthifolius*) dominate many of the natural habitats in the park, but aggressive habitat restoration efforts are currently on-going.

Common plants associated with southeast Florida beach dunes include sea-oat (*Uniola paniculata*), sea-grape (*Coccolobis uvifera*), cabbage palm (*Sabal palmetto*), and palmetto (*Serenoa* spp.). Dune species noted in John U. Lloyd SRA likely included seashore paspalum (*Paspalum vaginatum*), dune sunflower (*Helianthus debilis*), and beach elder (*Iva imbricata*).

Isolated pockets of coastal scrub communities may also be found within the vicinity of the project area. Common components of these habitats are saw palmetto (*Serenoa repens*), sand live oak (*Quercus geminata*), myrtle oak (*Q. myrtifolia*), yaupon (*Ilex vomitoria*), railroad vine (*Ipomoea pes-caprae*), sea oats (*Uniola paniculata*), sea purslane (*Sesuvium maritimum*), sea grape (*Coccoloba uvifera*), Spanish bayonet (*Yucca aloifolia*), and prickly pear (*Opuntia* sp.). This cover type is generally found in dune and white sand areas above the mean high tide line. The most notable coastal scrub habitat located within the project area is within the boundaries of John U. Lloyd SRA and south of the SRA along the same peninsula.

The piping plover (*Charadrius melodus*), a migratory shorebird, is protected as a threatened species by the State of Florida and the Federal government, and is also protected under the Migratory Bird Treaty Act. According to the American Ornithologists' Union (1998), the species breeds in the northern Great Plains, the Great Lakes region, and Atlantic Coastal States or Provinces from New Brunswick to South Carolina. Individuals of the species winter along the Atlantic and Gulf Coasts from Texas to North Carolina, arriving on Florida's coasts in September and departing for the north in March. Foraging areas include intertidal beaches, mudflats, sandflats, lagoons, and salt marshes, where they feed on invertebrates such as marine worms, insect larvae, crustaceans, and mollusks.

The least tern (*Sterna antillarum*) is a small member of the gull family (Laridae) listed by Florida as a threatened species (Florida Fish and Wildlife Conservation Commission [FWC] 1997) and

protected federally under the Migratory Bird Treaty Act. The eastern least tern population breeds primarily from coastal Maine through Florida (American Ornithologists' Union 1998). Florida populations arrive each year in mid- to late March to breed. They nest through mid-September, and typically choose open sandy substrates to form breeding colonies. Although typically nesting on open, sandy beach areas, an increasing number of colonies are located on open, flat, artificial surfaces (e.g., warehouse roof tops). Least terns forage along coastal areas feeding on small fishes, as well as some crustaceans and insects.

4.1.1 Mangroves

Historically in Broward County, freshwater wetlands and cypress swamps extended from coast to coast though mangroves were common on the western and southern coastline and on the barrier islands. As a result of dredging activities to create the AIW and the construction of jetties to ensure open access through the inlet to the ocean, salinity increased and freshwater wetlands were converted to estuarine communities over time. Mangroves became common along both sides of the AIW and in some places formed wide fringes over a mile wide.

Mangroves represent the largest natural habitat within the project boundaries, including several created wetland areas (Fig. 2). These habitats comprise either stands of red mangrove (*Rhizophora mangle*) or mixed stands of red mangrove and black mangrove (*Avicennia germinans*). Major associates include white mangrove (*Languncularia racemosa*) and buttonwood (*Conocarpus erectus*). Mangroves are important for shoreline protection and stabilization. In addition, mangrove habitats provide many important ecological functions, such as providing refugia for juvenile stages of managed fish species, and have been identified as significant resources for seven federally protected species and four federally protected subspecies (Odum and McIvor 1990). These systems also provide organic matter that forms the basis of a littoral zone marine food web.

Florida mangrove communities are known to support up to 220 species of fishes, 24 species of amphibians and reptiles, 18 species of mammals, and 181 species of birds (Odum et al. 1982). Managed fish species associated with mangroves during at least one life-cycle phase include pink shrimp (*Farfantepenaeus duorarum*), spiny lobster (*Panulirus argus*), jewfish (*Epinephelus itajara*), gray snapper (*Lutjanus griseus*), black drum (*Pogonias cromis*), red drum (*Sciaenops ocellatus*), and snook (*Centropomus undecimalis*) (South Atlantic Fishery Management Council [SAFMC] 1998a).

Sloughs (channels of slow-moving water) penetrate mangrove wetlands adjacent to channel areas. These are extremely important areas that provide species with passageways for movement into and out of interior mangrove areas. They are also important for refuge and feeding areas for various fishes and invertebrates.

The largest mangrove habitats in the project area occur along the western edge of John U. Lloyd SRA and to the north and west of the TN. Some mangrove fringe in the SRA was created by the Port as mitigation for previous impacts to native mangrove areas. Mangroves adjacent to the TN

are protected under a DEP conservation easement. Sloughs are associated with both of the major mangrove areas.

Staff from Federal and local regulatory agencies and project sponsors examined mangrove wetlands on September 12, 2001, to examine habitat quality. Mangrove wetlands in the project area were examined for the composition, maturity, tidal regime, position in the landscape, and overall functionality. Mangrove habitats similar in these characteristics were grouped together in a given category, and characterized as follows:

Mixed Mangrove Habitat: These mangroves are comprised of mixed stands of black and red mangroves and non-native invasive species, such as Brazilian pepper. These habitats are located north of the most northern mangrove creation area as described below under Created Mangrove Habitat and south of the USCG facility along the eastern side of the AIW. The width of the area averages 20 feet with mangrove coverage less than 50 percent.

Scattered Mixed Mangrove Habitat on the North Shore of the DCC: These mangroves comprise occasional lines of predominantly white and black mangroves, with some red mangroves, that have grown among scattered rock and fill on the eroding north shoreline of the DCC. Behind the 10-foot high trees is a row of Australian pine trees and an access road.

Mature Red Mangrove Habitat along the AIW: These mature mangroves provide valuable refugia and foraging area for fishes and motile invertebrates, such as juvenile spiny lobster and mangrove snapper (*Lutjanus griseus*).

Mature Red Mangrove Habitat at DCC: A healthy mangrove system is found along the DCC, just west of the high salt marsh mangrove area, and adjacent to Whiskey Creek. Mangroves average in height 12 to 16 feet.

Created Mangrove Habitat: As mitigation for Port improvements in the mid-1980s, mangrove habitat was created from scraping down uplands along the east shore of the AIW, in several areas north of the John U. Lloyd SRA boat ramp south to the DCC/AIW intersection. These wetlands are dominated by red and black mangroves with heights ranging between 2 to 12 feet. All of the areas are functioning as productive natural mangrove stands. Both killifish (*Fundulus* sp.) and puffers (*Sphoeroides testudineus*) were observed by the Service during the September 2001 field inspection. Tidal flushing was considered optimal along riprap that was staggered for the purpose of open water movement.

Mature Mangrove Habitat Bordered by Riprap: These red and black mangroves are separated from open water by riprap. These mangroves are located along the east side of the AIW next to the parking lot of John U. Lloyd SRA and west of the TN. Mangroves range up to 25 feet in height. A belted kingfisher (*Ceryle alcyon*) and little blue heron (*Egretta caerulea*) were observed during our September 2001 site inspection.

Stunted Mangrove/High Salt Marsh Habitat: Spoil deposition areas on the southwest corner of the intersection of the AIW and the DCC associated with previous AIW activity support red

and black mangroves less than 5 feet in height. Elevations are slightly higher than the adjacent mature mangroves to the west and soils are heavily laden with shell materials. Rainwater collects and pools in some areas, and much of the habitat is utilized by fiddler crabs and is adequate for use by wading birds. Elevations are too high to support tidal waters, fish, and aquatic macroinvertebrates, but rather this area functions as a high salt marsh supporting sea purslane and sea oxeye daisy (*Borrchia frutescens*).

4.1.3 Seagrass

Seagrasses provide many biological, chemical, and physical functions for marine communities. They provide habitat for a myriad of fishes, shrimps, crabs, and other species, and therefore have been designated as Essential Fish Habitat (EFH) by the SAFMC (1998a). Some of those species use seagrass meadows for the duration of their life cycles, whereas others use them for only a distinct life-history stage (e.g., as juveniles, for the purpose of refuge). Seagrasses are used as food sources for protected species such as manatees and sea turtles. Epiphytes, using seagrass blades as substrates, provide another primary food source for grazers, which in turn are consumed by larger species (invertebrates, small fishes) foraging in the beds. Seagrasses also provide important ecosystem cycling functions. For example, they produce oxygen, which is released to the water during photosynthesis. In addition, seagrasses absorb some nutrients from the water column. This may help to reduce suspended algae concentrations. Epiphytes using seagrass blades as a substrate may sequester additional nutrients from the water column. Again, this may contribute to limiting water-column algae production. Other water quality benefits may also occur as grasses and associated epiphytes trap fine, suspended solids from the water-column. Finally, seagrasses stabilize sandy bottoms with roots and rhizomes, and decrease wave action where meadows are dense. These functions increase water clarity, beneficial to primary production, species interaction, and in the recreational quality of coastal areas.

In southeast Florida, seagrasses are associated with such flora as algae of the genera *Halimeda*, *Udotea*, and *Penicillus* (Zieman 1982). Many invertebrate species also utilize seagrass communities. The most obvious inhabitants include the queen conch (*Strombus gigas*), urchins including the long spine urchin (*Diadema antillarum*), nudibranchs, bivalve mollusks, and crustaceans including the spiny lobster, and the blue crab (*Callinectes sapidus*). On shallow seagrass areas, corals and sponges may also occur (Zieman 1982). Many fish species have also been shown to have life cycles dependent on seagrass beds. Of particular importance are the mullet (*Mugil cephalus*), snook, and many prey species including mojarras and pinfish. Seagrass beds are also important nurseries for many of the fish associated with the snapper-grouper complex (SAFMC 1998a).

Marine seagrass species observed within the study area include manatee grass (*Halodule wrightii*), paddle grass (*Halophila decipiens*), and Johnson's seagrass (*Halophila johnsonii*), the only federally protected seagrass species (DC&A 2000, 2001) (Figs. 3 and 4). Seagrass communities are comprised of mixed beds of *H. decipiens* and *H. wrightii*, mixed beds of *H. decipiens* and *H. johnsonii*, monospecific beds of *H. johnsonii*, and monospecific beds of *H. decipiens*. Mapped seagrass areas are illustrated in Figures 3 and 4. Video surveys within the OEC confirmed the presence of isolated patchy beds of *H. decipiens* in 45 feet of water (DC&A

2000). Other grass beds were found in nearshore areas east of the NTB, south of the IEC, and near the north entrance to the SAC (east side). Three other grass beds were found in the SAC. One seagrass bed was found in the DCC, and several other beds were found along the AIW (south of the SAC), terminating at the intersection of the DCC and the SAC.

Frequency of occurrence and coverage for each species was calculated following surveys (comprising a total of up to 67 transects) in 1999 and 2001 (DC&A 2000, 2001). Average seagrass frequency-of-occurrence values were 11 percent, 12 percent, and 8 percent for *H. johnsonii*, *H. decipiens*, and *H. wrightii*, respectively. When present in sampled transects, average percent-area coverage for each species was less than 5 percent. Percent-area coverage was greatest for *H. johnsonii*, followed by *H. decipiens*, and then *H. wrightii*.

4.1.4 Unvegetated Softbottom Habitat

Softbottom areas are defined as areas where hard substrates are covered by more than 5 inches of sediment, typically sand, mud, clay, or silt. Also, for the purposes of classification in this document, "softbottom habitats" may include those with small-diameter rubble left over from previous dredging events, or may support isolated macroalgae beds. Softbottom areas may provide corridors for reef species to travel between reef lines and these areas may also be important foraging areas for some fish species (Jones et al. 1991). Macroalgal growth is occasionally associated with these communities, particularly where wave action does not disturb sediments and where sufficient light reaches the substrate (*i.e.*, shallow areas of the AIW, or fairly transparent waters offshore). The most abundant species are of the green algae genera *Caulerpa* sp., *Halimeda* sp., and *Codium* sp. during the summer months. This is in contrast to the winter months, when *Dictyota* sp. and *Sargassum* sp. are more common (Courtenay et al. 1974, Florida Atlantic University and Continental Shelf Associates, Incorporated 1994).

The benthic infaunal community generally comprises polychaetes, mollusks, and various amphipod crustaceans. Species composition and numerical dominance varies according to water depth, light penetration, and other physical characteristics. In inshore waters, such as the AIW, diversity and population density of these taxa are generally higher on the shallow shoals than in deeper waters of the harbor and channel (Messing and Dodge 1997, Rudolph 1986). Benthic community monitoring data for the shallow, inshore shelves of the study area indicate that the softbottom community is dominated by several taxa of polychaete worms, oligochaetes, mollusks, sipunculans, peracarid crustaceans, platyhelminthes, and nemertina, and that species richness is moderately high. Based on studies by Messing and Dodge (1997) and Rudolph (1986), as many as 370 species of invertebrates exist within the shallow water benthic community. Rudolph (1986) also determined that species richness was higher near ocean inlets and in seagrass beds.

In offshore softbottom communities, the numerically dominant organisms tend to be polychaete and nematode worms. The Dodge et al. (1991) infaunal study of offshore habitats of Hollywood Beach indicated that the dominant taxa were polychaetes (52 percent), nematodes (14 percent), and crustaceans (9 percent). Invertebrate fauna also utilize this softbottom area, including the Florida fighting conch (*Strombus alatus*), milk conch (*Strombus costatus*), king helmet (*Cassia*

tuberosa), and the queen helmet (*Cassia madagascariensis*) (Corps 1996). This area, since it lies within the second and third reef lines within the study area, may provide a corridor for reef species to travel between reef lines and also be an important foraging area for some fish species (Jones et al. 1991).

Softbottom substrates that will be affected by the project occur in previously dredged inshore and offshore channels, previously dredged inshore basins, non-dredged, shallow, inshore areas, and deeper offshore areas adjacent to dredged channels. In the Port entrance channel, softbottom habitats are typically located between hardbottom reef and between rock/rubble habitats, and occasionally support seagrass and macroalgae beds. These typically have a sandy composition. Within the dredged harbor and inshore channels, softbottom habitats develop in channel beds as sediment accumulates from side-slope sloughing or from natural geological processes acting in areas that have consolidated sub-surface rock. Surficial materials in inshore areas are composed of variable amounts of sand, silt, and mud, depending on geology and adjacent land use/habitats. Shallow, inshore, softbottom areas also have variable substrate composition.

4.1.5 Rock/Rubble Habitats

Rock/rubble habitats occur among all dredged areas within the project area, and where rock outcrops occur in/near reef habitats. Rock/rubble substrates within the project area may comprise either naturally occurring rock outcrops or rubble material that has been left from prior dredging events. These substrates provide structure for use by fishes and motile invertebrates, and may also provide surfaces for attachment of soft corals and sessile organisms, such as sponges. Within much of the entrance channel, rock/rubble cover alternates with softbottom habitats, creating a habitat mosaic with regularly repeating patterns.

The most obvious biological features of most rock/rubble-based habitats are sponges and macroalgae. If water depth/water clarity is appropriate and there is a nearby source population, such substrates are conducive for reef-building species. The latter case was apparent in the channel zone adjacent to the existing reef tracts (DC&A 2001). Observed sponge species included *Ircinia campana*, *Callyspongia vaginalis*, and *Iotrochota* sp. (possibly *I. birotulata*). Observed soft corals were similar to those of adjacent reefs, and included the genera *Eunicea*, *Plexaura* and *Pseudopterogorgia* (DC&A 2001). Habitats provided by rock and rubble and associated sponges, algae, and soft corals provide significant refugia for many species of small fishes, and larger gamefish species that prey on them.

4.1.6 High and Low Relief Hardbottom and Coral Reefs

The most prevalent hardbottom and reef zones within and adjacent to the project area fall within four areas, a nearshore hardbottom zone and three offshore reef tracts (Fig. 5). The nearshore hardbottom communities typically occur in 0 to 10 feet of water and exist in a physically stressed environment. This hardbottom area is part of the Miami Oolite Formation of Broward and Dade Counties (Hoffmeister et al. 1967). Although sections of the zone may be covered with broken shell and sand, wave action frequently exposes the oolite formations. Nearshore hardbottom

areas east of John U. Lloyd SRA have been characterized using multi-spectral image analysis and ground-truthing (Fig. 5). Depending on distance from shore, these oolitic limestone formations may support communities dominated by algae and sponges with interspersed gorgonians and hard corals.

Seaward of the nearshore hardbottom reef area are three separate parallel reef tracts. The first reef occurs from approximately 100 to 2,000 feet from shore; the second reef is located 3,000 to 6,000 feet offshore; and the third reef is approximately 8,000 feet or more offshore (Corps 1996). There is an extensive sandy area located between the second and third reef lines (Corps 1996). The area between the first and second reef lines is characterized by small isolated hermatypic coral heads and interspersed coral rubble interrupting areas of open sand. These reefs, particularly south of the OEC, are subject to fluxes of decreased water quality due to interior harbor and canal flushing. These reefs are lower profile than the outermost reef.

Limestone rock and rubble remaining from previous dredging events provide hardbottom with variable-depth profiles. Since the previous dredging event, gorgonians, corals and sponges have colonized these substrates. These low and high relief reef areas in the 42-foot-deep OEC are found among softbottom habitats, rock/rubble habitats, and patchy *Halophila decipiens* beds (DC&A 2001). In general, these rock-reefs are not as biologically diverse as undredged reefs outside the channel zone. However, where the channel-bed rock-reefs and channel walls lie adjacent to undredged offshore reef lines, biodiversity and colony density increase. Channel wall habitats have less coral coverage than channel-bed habitats, but provide significant refugia for reef-associated fishes. Even channel wall habitats not associated with reef lines are significant resources. These may be considered "vertical hardbottoms." Seaward from the confluence of the IEC with the AIW, biotic cover of channel bed and wall substrates increase, and undergo a taxonomic progression from scattered algae, sponges, bryozoans, and tunicates, to a more diverse mixture including gorgonians and hard coral. Extensive biotic cover of channel-wall substrates occurs from the jetty to the end of the OEC. This pattern is more pronounced on the north side, in terms of fish species richness and population density.

Hardbottom reef and coral reef communities of Florida's southeast coast are predictably speciose and have been characterized many times (see Dodge et al. 1991 and Seaman 1985). Species composition of the nearshore hardbottom and the three offshore reef tracts depends on depth, distance to shore, exposure to waves and currents, light penetration, and disturbance/dredging regime.

Nearshore Hardbottom Reef. The nearshore hardbottom habitat is very dynamic and the species associated with this habitat are able to quickly recover from the stresses imposed by the environmental conditions. The dominant algae associated with these communities are in the genera *Caulerpa* sp., *Jania* sp., *Laurencia* sp., *Dictyota* sp. and *Halimeda* sp. (Dodge et al. 1991, Vare 1991). Also associated with this nearshore hardbottom are algal mat species of the genera *Cladophora*, *Chaetomorpha*, and *Gelidiopsis* (Corps 2000a). The rock outcrops in this area tend to be covered with sponges of the genera *Ircinia* sp., *Niphates* sp., *Cliona* sp., and *Iotrochota* sp. Interspersed among these sponges are colonial anemones (*Zoanthus* sp.), and hydrocorals

(*Millepora alcicornis*). This habitat often provides suitable habitat for a variety of other invertebrate species (Corps 2000a).

Hardbottom Within Channel Zone. This area of low relief hardbottom is rock exposed from prior dredging events and supports many quickly colonizing species such as sponges (e.g. *Ircinia* sp., *Niphates* sp., *Cliona* sp., and *Iotrochota* sp.) and gorgonians (e.g. *Eunicea* sp., *Plexaura* sp. and *Pseudopterogorgia* sp). Species diversity and colony densities are lower within the channel than they are in reefs adjacent to the channel that has not been dredged. Channel walls, like the channel bed, that were created as the entrance channel was dredged, now provide substantial habitats for many species, particularly fishes (see below).

Adjacent Coral Reefs/Hardbottom Reef. The three distinct reef tracts offshore of Broward County are consistent with the overall assemblage of stony corals, sponges, and gorgonians found throughout Dade, Broward, and Palm Beach Counties (Corps 2000a). The most dominant feature of the reef communities near Port Everglades is the high density of gorgonians. These gorgonian corals are primarily of the genus *Eunicea* sp., *Plexaura* sp. and *Pseudopterogorgia* sp. Hard coral species also make up a significant part of the reef assemblages in this area and include *Porites asteroides*, *Diploria clivosa*, *Siderastrea siderea*, and *Montastrea cavernosa* (Dodge 1991, Vare 1991). The most diverse of the adjacent reefs is the outermost reef tract. Also, that reef has the highest density of colonies.

Ichthyofauna. A visual fish survey was conducted in May 2001 at nearshore hardbottom and offshore reef sites along transects within the entrance channel and adjacent areas. The results of these surveys are shown in Table 2 (DC&A 2001). Fish species encountered within the entrance channel to Port Everglades consisted primarily of members of the family Pomacentridae (damselfishes) and Labridae (wrasses). Also abundant were juvenile haemulid (grunt) and lutjanid (snapper) species. These fishes, members of the snapper-grouper complex, are important due to their recreational and commercial value. In total, over 22 species of fish were recorded within the jetty of the entrance channel (DC&A 2001).

Only 10 species of fish were observed in the nearshore hardbottom area (this habitat was the least sampled of all hardbottom/reef areas) in the May 2001 survey. Once again, labrids and pomacentrids were the dominant species present, while scarids (parrotfishes) and acanthurids (surgeonfishes) were also commonly seen. Within this habitat, yellowtail snapper (*Ocyurus chrysurus*) was also observed. Other species of fish that use this nearshore hardbottom area include bar jacks (*Caranx ruber*), hogfish (*Lachnolaimus maximus*), and porkfish (*Anistroremus virginicus*) (Coastal Systems International 1997).

The offshore coral reef areas observed had the highest number of fishes encountered, with 36 species observed. Once again the most abundant species encountered were wrasses and damselfish. The bluehead wrasse (*Thalasomma bifasciatum*), cocoa damselfish (*Pomacentrus variabilis*) and the beaugregory damsel (*Pomacentrus partitus*) were among the most common. This concurs with similar findings by Spieler (1998). Of particular interest, juvenile red grouper (*Epinephelus morio*), yellowtail snapper, Spanish mackerel (*Scomberomorus maculatus*), and

grunts (Haemulidae), were recorded within these offshore reef habitats. All of these species are listed in SAFMC (1998a).

The Service performed SCUBA inspections of selected areas on October 10, 2001, and March 19, 2002, with DC&A, National Marine Fisheries Service (NMFS), and DEP. Impact area inspections of the channel wall and channel bed habitats revealed mutton snapper (*Lutjanus analis*), hogfish (*Lachnolaimus maximus*), graysby (*Epinephelus cruentatus*), porkfish (*Anisotremus virginicus*), damselfishes (family Pomacentridae), parrotfishes (family Scaridae), wrasses (family Labridae), angelfishes (family Pomacanthidae), and spiny lobster. Rock/rubble (1-2 foot relief with occasional 3 foot high boulders) in the channel bed and crevasses in the channel wall contributed significantly to species diversity, even where coral coverage was sparse.

4.1.7 Essential Fish Habitat

The community types listed above are considered EFH as described in the Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267). EFH provisions support the management goals of sustainable fisheries. EFH that may be directly and indirectly impacted by the proposed project are likely to include the water column, littoral zone, sublittoral zone, hardbottom, and seagrass habitats. Specific aspects of EFH that may be adversely affected include spawning, foraging, predator/prey relationships, and refuge habitats for managed species such as the snapper/grouper complex, penaeid shrimp, and spiny lobster. The NMFS is the lead agency responsible for the complete assessment of the possible adverse impacts of the proposed project to EFH.

The SAFMC (1998a) has designated mangrove, seagrass, nearshore hardbottom, and offshore reef areas within the study area as EFH. The nearshore bottom and offshore reef habitats of southeastern Florida have also been designated as EFH-Habitat Areas of Particular Concern (EFH-HAPC) (SAFMC 1998a). Managed species that commonly inhabit the study area include pink shrimp, and spiny lobster. These shellfish utilize both the inshore and offshore habitats within the study area, including macroalgae beds (e.g., *Laurencia* spp.). Members of the 73-species snapper-grouper complex that commonly use the inshore habitats for part of their life cycle include bluestriped grunts (*Haemulon sciurus*), French grunts (*Haemulon flavolineatum*), mahogany snapper (*Lutjanus mahogoni*), yellowtail snapper, and red grouper. These species utilize the inshore habitats as juveniles and sub-adults. As adults, they utilize the hardbottom and reef communities offshore. In the offshore habitats, the number of species within the snapper-grouper complex that may be encountered increases. Other species of the snapper-grouper complex commonly seen offshore in the study area include gray triggerfish (*Balistes capriscus*) and hogfish (*Lachnolaimus maximus*). Coastal migratory pelagic species also commonly utilize the offshore area adjacent to the study area. In particular, king mackerel (*Scomberomorus cavalla*) and Spanish mackerel (*Scomberomorus maculatus*) are the most common.

Snook, an important gamefish in the State of Florida, is currently listed as a species of special concern by the State of Florida (FWC 1997). The species is associated with several habitats found within the project area. Another species listed by the State as a Species of Special

Concern is the mangrove rivulus (*Rivulus marmoratus*). These small fish likely occupy mangrove habitats associated within John U. Lloyd SRA and West Lake Park.

As many as 60 corals can occur off the coast of Florida (SAFMC 1998a), all of which fall under the protection of the management plan.

As described in the Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), the EFH provisions of the act support the objective of maintaining sustainable fisheries. Mitigation would be required for first-time impacts to seagrass beds and reef/hardbottom habitats. In addition, mitigation will not be required for dredging softbottom habitats lacking seagrasses or for habitats with rubble substrates within the channel since dredging was previously performed in the channel.

The focus of the mitigation policy is to conserve and enhance EFH and to avoid, minimize, and thereafter compensate for impacts to EFH due to development activities. Like other Federal agencies with regulatory responsibilities, the first priority of the NMFS is to advocate avoidance of impacts to natural resources when presented with any development plan. However, when unavoidable impacts to EFH are proposed, NMFS may recommend mitigation measures to compensate for any loss of resource value. Recommendations may include restoration of riparian and shallow coastal areas (*i.e.*, reestablishment of vegetation, restoration of hardbottom characteristics, removal of unsuitable material, and replacement of suitable substrate), upland habitat restoration, water quality improvement or protection, watershed planning, and habitat creation. The preferred type of mitigation is enhancement of existing habitat, followed by restoration, and finally creation of new habitat.

4.2 Threatened and Endangered Species

4.2.1 Sea Turtles

Broward County is within the normal nesting range of the federally threatened loggerhead sea turtle (*Caretta caretta*), the endangered green sea turtle (*Chelonia mydas*), and the endangered leatherback sea turtle (*Dermochelys coriacea*). Within the 38.6 miles of beach from the Palm Beach County line to the Miami-Dade County line, a total of 2,620 sea turtle nests were found in 1999 (Burney and Margolis 1999). From 1990 through 1999, an annual average of 2,446 sea turtle nests was documented on Broward County beaches. Within John U. Lloyd SRA, a total of 212 sea turtle nests were observed during 1999. A summary of sea turtle nesting activity for the SRA is found in Table 3. The majority of sea turtle nesting activity occurred during the summer months of June, July and August, with nesting occurring as early as March and as late as September (Burney and Margolis 1999). The waters offshore of Broward County are also habitat used for foraging and shelter for the three species listed above and possibly the hawksbill turtle (*Eretmochelys imbricata*), and the Kemp's ridley turtle (*Lepidochelys kempii*) (Corps 2000a).

4.2.2 West Indian Manatee

The federally endangered West Indian manatee (*Trichechus manatus*) is found from coastal areas of Beaufort, North Carolina through Florida and the Gulf of Mexico. Manatees frequently inhabit shallow areas where seagrasses are present and are commonly found in protected lagoons and freshwater systems. In winter, they frequently move into areas where water temperatures are mitigated by spring-fed streams or power generation plant effluent, such as the Florida Power and Light (FPL) power plant in Fort Lauderdale. In general, very few manatees are present in the offshore waters from November through April. However, during the remainder of the year, manatees occasionally use open ocean passages to travel between favored habitats (Hartman 1979).

The West Indian manatee is protected under the ESA and the Marine Mammal Protection Act (MMPA) of 1972. The State of Florida provided further protection in 1978 by passing the Florida Marine Sanctuary Act designating the state as a manatee sanctuary, and providing signage and speed zones in Florida's waterways. Though there are not any areas within Broward County that are designated as Critical Habitat for the West Indian manatee, the waterways in Broward County support permanent and transient population of manatee. Some waterways serve as important warm water refugia and caving areas, particularly in the vicinity of Port Everglades and the FPL power plant.

Surveys indicate that during winter months when temperatures decline, manatees from north and south of Port Everglades migrate to canals associated with the FPL power plant at Port Everglades. As many as 290 manatees have been observed near the Port Everglades plant on a single day, according to a 2000-2001 survey (Mezich 2001). During the summer months when the water warms, many manatees return to the counties to the north and south to forage and reproduce. Telemetry and aerial surveys confirm that manatees are present within Broward County year-round (Fig. 6).

4.2.3 American Crocodile

The American crocodile is a State and federally listed endangered species. The current range of the species in the southeastern United States includes coastal and estuarine habitats in the extreme southern Florida peninsula, including Broward County. Females nest primarily on northern Key Largo and from Florida Bay to Turkey Point. Nesting begins in March and extends until late April or early May. Approximately 90 days following fertilization, eggs are buried in sand or marl nests adjacent to deep water. Adult crocodiles feed at night on schooling fish in creeks, open water, and deep channels, and are also known to eat crabs, raccoons, and water birds.

At least one crocodile is known to occur within West Lake Park and one other may be present (Ricardo Zambrano, FWC, email, November 7, 2003).

4.2.4 Johnson's Seagrass

Johnson's seagrass (*H. johnsonii*) was listed as a federally threatened species by NMFS on September 14, 1998 (63 FR 49035) and a re-proposal to designate critical habitat pursuant to Section 4 of the ESA was published on December 2, 1998 (64 FR 64231). The final rule for critical habitat designation for Johnson's seagrass was published April 5, 2000 (Federal Register, volume 65, Number 66). Johnson's seagrass has one of the most limited geographic ranges of all seagrasses, and little is known about its natural history, biology, and ecology. Observations lending evidence for asexual reproduction and a limited capacity to store energy indicate that the plant may be especially vulnerable to human activity and natural impacts (NMFS 1998). It is known to occur only in lagoons between Sebastian Inlet and central Biscayne Bay on the east coast of Florida (NMFS 1998).

Johnson's seagrass occurs within the project area, specifically in the AIW east and south of the MTB, and just west of the DCC, and in the DCC (Figs. 3 and 4). Abundance and density values are low and the species is generally associated with *H. decipiens*. Johnson's seagrass also occurs south of the DCC within the historic bed of Whiskey Creek, along the western shore of the AIW and within the West Lake Park embayment (Miller Legg & Associates, Incorporated 2001). Cover abundance and density were higher along the west shore of West Lake Park than was observed within the Port Everglades project area.

4.2.5 Smalltooth Sawfish and Other Protected Fish Species

There are three protected fish species that might occur within the project area. The smalltooth sawfish (*Pristis pectinata*), federally protected as an endangered species, is under the purview of NMFS. It inhabits softbottom estuarine habitats in depths generally less than 30 feet. Its former range in U.S. waters extended from Texas through Maryland. Currently, few are observed outside peninsular Florida. At least one recorded observation has occurred in the vicinity of Broward County (NMFS 2000). Populations likely decreased due to a low intrinsic rate of natural increase, the long interval to time of reproduction, and human impacts, most notably overfishing, incidental take in nets (due in part to its body size and unusual morphology), and habitat loss (development of shoreline and nearshore habitats).

Two other fish species are protected by the State of Florida. Snook, an important gamefish in the State of Florida, is currently listed as a Species of Special Concern by the State (FWC 1997). The species is associated with several habitats found within the project area. Another species listed by the State as a Species of Special Concern is the mangrove rivulus. This small fish utilizes mangrove swamps and high saltmarsh areas (Taylor 1992), and has been identified within John U. Lloyd SRA (Steve Dale, DEP, "Unit Plan" listing protected species, January 12, 2002). Species that are not listed as endangered, threatened, or species of special concern by the State or the Service, but that are managed by the federal government, are discussed in the following subsection.

4.2.6 Whales and Dolphins

The northern right whale (*Eubalaena glacialis*) is a federally listed endangered species and is protected under the MMPA. The current migratory population within the Atlantic Region is less than 350 animals (Humphrey 1992). Right whales are highly migratory and summer in the Canadian Maritime Provinces. They migrate southward in winter to the eastern coast of Florida. The breeding and calving grounds for the right whale occur off of the coast of southern Georgia and north Florida. During these winter months right whales are routinely seen close to shore in these areas. However, only a few sightings and strandings have occurred in/near Miami-Dade and Broward Counties. The NMFS is responsible for the protection of cetaceans. It is unlikely that other cetaceans listed as endangered species, such as fin whales (*Balaenoptera physalus*), humpback whales (*Megaptera novaeangliae*), and sperm whales (*Physeter macrocephalus*) would be observed in project impact areas. However, dolphins common to inshore waters of southeast Florida include the Atlantic spotted dolphin (*Stenella frontalis*), the spinner dolphin (*Stenella longirostris*), the spotted dolphin (*Stenella attenuata*), and the bottlenose dolphin (*Tursiops truncatus*), which is listed as *depleted* under the MMPA.

5.0 DESCRIPTION OF THE RECOMMENDED PLAN AND ALTERNATIVES

The Corps has proposed to widen and deepen most of the major channels and basins within Port Everglades to accommodate longer, wider, and deeper-draft commercial vessels and meet changes in the industry standard. The proposed action resulted from a comprehensive analysis of all the existing and future commercial vessel transit needs within the Port. As a result of this analysis, the following navigation improvements were recommended: (1) widen the OEC flare to allow safer transit for all the larger commercial vessels that sometimes experience troublesome cross currents at the channel entrance; (2) remove the Widener Shoal and widen the Southern Access Channel (SAC) to allow safer transit of containerized cargo vessels past the “knuckles” restriction where new-generation cruise vessels are expecting to berth; (3) widen and deepen the TN to provide turning capabilities for larger vessels and provide berthing for containerized cargo vessels; (4) deepen the STB to provide berthing capabilities for Panamax vessels at Berths 16 to 18; and (5) widen and deepen the DCC, in addition to a turning basin located adjacent to the SAC, to provide a relocation area for smaller and midsize containers, roll on/roll off vessels, and general cargo traffic, thereby reducing congestion in the areas servicing larger vessels (Fig. 7).

Seven alternatives were analyzed by the Corps, which included seven action alternatives and the No-Action Alternative (Table 4). The Recommended Plan, identified as Alternative 7, would deepen, widen, and extend the OEC (Fig. 8); deepen and widen the SAC; deepen and widen the TN (Fig. 9); deepen and widen the DCC; remove material at the Widener Shoal; deepen the IEC (Fig. 10); deepen the MTB (Fig. 11); deepen the STB (Fig. 12). Disposal of dredged materials would occur at approved upland disposal sites. The Recommended Plan would impact 11.55 acres of mangrove wetlands, 0.99 acres of seagrass habitat within the existing channel, 4.01 acres of seagrass habitat outside of the existing channel, 14.89 acres of low relief reef habitat, 10.82 acres of high relief reef habitat, 218 acres of unvegetated bottom habitat, and EFH. Impacts to marine mammals, sea turtles, and fish species may occur due to loss of habitat and blasting

activities due to project construction. Mixed and monoculture beds (2.44 acres) of Johnson's seagrass threatened species would also be impacted by the recommended alternative. The impacts are expected to be temporary, as much of the habitat would either recover or be replaced. The Recommended Plan would also impact water quality by causing increased turbidity during construction activities, although these impacts would be temporary. Mitigation for seagrass, mangrove, and unvegetated bottom habitat is proposed by creating and enhancing mangrove and seagrass habitat at West Lake Park immediately south of the project site. Artificial reef habitat creation is proposed to offset impacts to high and low relief reef habitat.

Construction structures include environmental friendly bulkheads, riprap, and culverts. Bulkhead construction would usually be conducted from barges, and will take place prior to channel, basin, or berth excavation activities. Construction of the USCG basin may incorporate land-based construction support. Concrete caps and facings on bulkheads would take place immediately following bulkhead installation. Riprap will be placed in several areas, and where deemed environmentally beneficial, will be placed atop bulkheads in order to allow tides to penetrate habitats.

Land-based excavation (use of truck-mounted or crawler cranes with clamshell attached, Grade-all, loaders, and bulldozers) is planned for easily accessible sites such as the new USCG basin and areas adjacent to the DCC and TN. These methods may be used along the SAC, if necessary, only where there are previously established roads/access points.

Softer substrates (*i.e.*, the majority of substrates planned for removal) will be removed via dredging. Where hard rock is encountered, the Corps anticipates that contractors will utilize other methods, such as blasting, use of a punch-barge/pile driver, or new, large cutterhead equipment. Of these alternatives, the Corps prefers the use of large cutterheads. However, the Corps cannot specify types of dredging/substrate-removal equipment in requests for bids. If contractors do not use large cutterhead equipment, the Corps prefers blasting to the use of punch-barge or pile driver, since the duration of noise impacts from blasting is 20 seconds, twice daily. Compared to the constant pounding of a punch-barge, blasting may have less detrimental indirect impacts on marine mammals. In addition, punch-barge use would be more costly and take considerable more time to achieve destruction of certain rock substrates (Konya 2001).

5.1 Spoil Disposal

The Corps has determined that the unconsolidated excavated materials are not beach compatible, and, consequently, not suitable for beach disposal. Disposal of such substrate will likely consist of pumping materials through a pipeline to one of two candidate disposal sites, "Disposal Site 1" and "Disposal Site 2," both of which will be provided by Broward County. They are located just north of the DCC (Fig. 13). Site 1 is a 62-acre site located on Port property, and Site 2 is a 64-acre site located on airport property.

Site 1 is a previously used disposal site, currently being cleared of previously deposited material to allow for use in the proposed project. This site lacks wetlands and other natural areas. Site 2 is comprised of a construction staging area for the airport and a car rental facility. No wetlands

are found on the site, and only approximately 10 percent of the parcel is currently forested (Dolores Smith, Environmental Coordinator, Fort Lauderdale-Hollywood International Airport, telephone conversation, March 8, 2002). Both sites have undergone a hazardous, toxic or radioactive waste (HTRW) assessment in accordance with ER-1165-2-123, HTRW Guidance for Civil Works Projects. Results of the assessment indicated no evidence of contamination at the two sites.

Disposal may take place in phases (*i.e.*, cycles of dewatering and removal) for Disposal Site 2, whereas there are no plans for removing dewatered materials from Site 1 after the current project. Large rock aggregates will be placed at designated artificial reef locations, probably by a split-hull or similar barge.

A preliminary dike design applicable to both disposal sites has been prepared. Design dimensions include a 3:1 exterior slope, a 12-foot-wide crest, a 2.5:1 vertical interior slope, and a 20-foot-wide berm between the interior toe of the embankment and the top of slope for the excavation. The embankment slope for interior excavation will be 2.5:1.

5.2 Blasting Methodology

During consultation regarding blasting, the Corps agreed to implement the same blasting protection measures and monitoring procedures as proposed for the expansion of the Port of Miami and deepening of the Lummus Turning Basin (Miami Harbor, Phase II), known as the Navy Diver Protocol, plus an additional 500 feet to the safety zone. Furthermore, the Corps agreed to revise the blasting protection measures should the results of the Miami Harbor Phase II indicate the need based on input from State, Federal, and local governmental agencies. In addition, the Corps has agreed to avoid blasting activities during the winter (November 15 to March 15), when manatees typically are present in greater numbers.

The Corps states that to achieve the proposed depths at Port Everglades, pretreatment of the rock areas may be required. Blasting is anticipated for deepening the Main Harbor Area (MTB and STB), South Access Channel, and the TN.

The channel excavation activities may occur in the following manner:

1. Contour dredging with either bucket, hydraulic or excavator dredges to remove material that can be dredged conventionally and determine what areas require blasting;
2. Pre-treating (blasting) the remaining above grade rock, drilling and blasting the "Site Specific" areas where rock could not be conventionally removed by the dredges;
3. Excavating with bucket, hydraulic or excavator dredges to remove the pre-treated rock areas to grade; and

4. All drilling and blasting will be conducted in strict accordance with local, State and Federal safety procedures. Marine Wildlife Protection, Protection of Existing Structures, and Blasting Programs coordinated with Federal and State agencies.

In addition, industry standards and Corps, Safety & Health Regulations typically limit the weight of explosives to be used in each blast to the lowest poundage (approximately 90 pounds or less) possible to adequately break the rock. The following safety conditions are standard and will likely be implemented in conducting underwater blasting:

1. Drill patterns are restricted to a minimum 8-foot separation from a loaded hole;
2. Hours of blasting are restricted from 2 hours after sunrise to 1 hour before sunset to allow for adequate observation for protected species;
3. Selection of explosive products and their practical application method must address vibration and air blast (overpressure) control for protection of existing structures and marine wildlife;
4. Loaded blast holes will be individually delayed to reduce the maximum pounds per delay at point detonation, which in turn will reduce the mortality radius;
5. The blast design will consider matching the energy in the “work effort” of the borehole to the rock mass or target for minimizing excess energy vented into the water column or hydraulic shock.

The U.S. Navy Dive Manual and the FWC Endangered Species Watch Manual calculate the radius (in feet) of the danger zone, R, for an uncontrolled blast suspended in the water column as:

$$R = 260 \times (\text{the cube root of the weight of the explosive charge in pounds}).$$

The Corps contends this formula is conservative for the blasting in the Port because the blast will be confined within the rock and will not suspend in the water column.

5.2.1 Proposed Protection Measures

Because of the potential duration of the blasting and the proximity of the blasting to important habitats, the Corps has indicated that in addition to the *Standard Manatee Protection Construction Conditions*, conservation methods will be included in the project design to reduce possible adverse effects to marine wildlife. The Corps recognizes that it is crucial to balance the demands of the blasting operations with the overall safety of the species. However, a safety radius that is excessively large will result in significant delays that prolong the blasting, construction, traffic and overall disturbance to the area. A radius that is too small puts the animals at too great of a risk should one go undetected by the observers and move into the blast area. Because of these factors, the goal is to establish the smallest radius possible without compromising animal safety and provide adequate observer coverage for whatever radius is

agreed upon. The Service has provided suggestions concerning the blasting protocols in the Recommendations section of this FWCA Report.

The Corps has indicated that aerial reconnaissance of the safety radius, where feasible, will be implemented and added to a boat-based and land support reconnaissance. An observer will be placed on the drill barge for the best view of the actual blast zone and to be in direct contact with the blast contractor in charge. In addition, the Corps will not conduct inshore blasting activities during the winter when manatees are most likely to be concentrated.

5.2.2 Proposed Test Blast

Prior to implementing a blasting program a Test Blast Program (TBP) will be completed. The purpose of the TBP is to demonstrate and/or confirm the following: (1) drill boat capabilities and production rates; (2) ideal drill pattern for typical boreholes, (3) acceptable rock breakage for excavation; (4) tolerable vibration level emitted, (5) directional vibration; and (6) calibration of the environment.

The TBP begins with a single range of individually delayed holes and progresses to the maximum production blast intended for use. Each test blast is designed to establish limits of vibration and airblast overpressure, with acceptable rock breakage for excavation. The final test event simulates the maximum explosive detonation as to size, overlying water depth, charge configuration, charge separation, initiation methods, and loading conditions anticipated for the typical production blast.

The results of the TBP will be formatted in a regression analysis with other pertinent information and conclusions reached. This will be the basis for developing a completely engineered procedure for the Blasting Plan. During the testing the following data will be used to develop a regression analysis: (1) distance; (2) pounds per delay; (3) peak particle velocities; (4) frequencies; peak vector sum; and (5) air blast overpressure.

5.2.3 Other Rock Removal Methods Considered

The Corps has investigated other alternatives to remove the rock in Port Everglades without blasting through the use of a punch-barge. It was determined that the punch-barge, which would work for 12-hour periods, strikes the rock below approximately once every 30 seconds. This constant pounding would serve to disrupt manatee behavior in the area, as well as impact other marine animals in the area. Using the punch-barge will also extend the length of the project temporally, thus increasing any potential impacts to all fish and wildlife resources in the area.

The Corps believes that blasting is actually the least environmentally impacting method for removing the rock in the Port. Each blast will last no longer than 25 seconds in duration, and may even be as short as 2 seconds, and will be spaced 12 hours apart. Additionally, the blasts are confined in the rock substrate. Boreholes are drilled into the rock below, the blasting charge is set and then the chain of explosives is detonated. Because the blasts are confined within the rock structure, the distance of the blast effects are reduced as compared to an unconfined blast.

5.2 Proposed Mitigation

Mitigation for mangrove and seagrass impacts would be provided through the West Lake Park restoration program. Mitigation for reef and hardbottom impacts would be provided through artificial reef creation at existing permitted sites off Broward County.

The Draft West Lake Master Plan (Miller Legg & Associates, Incorporated 2001) was developed by consultation with Broward County's Port Everglades Department, Parks and Recreation Division, and Aviation Department to restore and enhance wetlands and other ecosystems at West Lake Park. Mitigation measures on the West Lake Park property would conform with the approved master plan under development and following agency concurrence. Table 5 provides a summary of conceptual creation, restoration, enhancement, and acquisition opportunities with acreages and benefits for all measures.

5.3.1 Mangrove Mitigation

The Port Everglades Navigation Project Draft Comprehensive Mitigation Plan submitted by the Corps includes the creation, restoration and enhancement of mangrove wetlands and associated estuarine resources through a number of approaches including the restoration of mangroves on 9.0 acres of spoil islands and the restoration of 9.2 acres of shallow water tidal flats. Out-of-kind measures would include shoreline stabilization with riprap to protect over 185 acres of estuarine resources; the restoration of tidal channels and installation of new culverts which would provide water quality and ecological benefits to 118 acres of estuarine resources; maintenance dredging of 25 acres to remove silt and improve tidal flushing; and wetland planting of exposed banks and highly erodible soils (18 acres), which would provide benefits to 56 acres of mangrove habitat.

5.3.2 Seagrass Mitigation

Seagrass habitat would be created through the removal of 8.1 acres of spoil islands and stabilization of shorelines within each excavated area. Three spoil areas would be excavated to an elevation consistent with the depths where seagrass beds occur adjacent along the AIW. It is anticipated that depths would range from -1 foot to -4 feet Mean Sea Level. Seagrass recruitment would occur rapidly by *H. wrightii* and both *H. decipiens* and *H. johnsonii*, all of which commonly occur along the shallow flats adjacent to the mangrove fringe. In the event that natural recruitment has not occurred within 12 to 18 months following excavation, planting of seagrass donor material would be initiated. Submerged aquatic vegetation (SAV) restoration within West Lake Park would occur as a result of enhanced flushing and circulation patterns along the southeastern region of the interior lagoon. Over 12 acres of flushing channels would be expanded, improved or culverts installed, resulting in improved water quality, clarity and substrate conditions more suitable for seagrass propagation in the interior embayment. Based on observed changes in seagrass cover and existing seagrass bed occurrences, it is anticipated that 40 to 60 acres of SAV, including *H. johnsonii* would be restored. Monitoring would be conducted to document physical changes in the lagoon and seagrass recruitment.

5.3.3 Other Proposed Enhancement Measures in West Lake Park

Other measures proposed to protect and/or enhance fish and wildlife and protected species known to occur in the park include enhancement to bird rookeries (2.0 acres), the installation of manatee protection barriers at the entrance to Whiskey Creek and other channels occupying 56 acres of the park land, and the establishment of five osprey towers. Over 100 acres of out-parcels would also be acquired and placed under a conservation easement.

The mitigation plan proposes several activities that may improve water quality and hydraulics in West Lake Park and the surrounding estuary. According to the plan, results may include benefits to existing submerged aquatic vegetation (SAV) habitat and mangroves and benefit through creation of substrates suitable for colonization by SAV and mangroves. Proposed activities include removal of silt in 25 acres of tidal channels and the installation of new culverts to increase circulation/tidal flushing through approximately 12 acres of tidal channels. The complete West Lake Mitigation Plan is presently undergoing interagency review as a Regional Offsite Mitigation Area. The Corps Regulatory Division is reviewing the project under Application No. 2002000072 (IP-BP).

5.3.4 Proposed Mitigation Monitoring at West Lake Park

The following monitoring plan for mangrove wetland restoration was developed by Miller Legg & Associates, Incorporated, on behalf of the Broward County Parks and Recreation Division, and submitted to Broward County Department of Planning and Environmental Protection, the South Florida Water Management District, and the Corps' Regulatory Division as Appendix 13 of an application for the Environmental Resource Permit that will govern compensatory mitigation activities that may take place in West Lake Park (Miller Legg & Associates, Incorporated 2001). Because the current project proposes to utilize West Lake Park for mitigation areas, the Corps similarly proposes this plan for use in mangrove restoration areas developed to compensate for losses of mangrove habitat due to implementation of the Recommended Plan.

- Tree/shrub plantings will be visually monitored to assess survivorship rates. Survivorship rates or planted trees/shrubs in mangrove and maritime hammock areas will be assessed based upon counts of flagged trees randomly placed within plus or minus 2-meter-wide belt transects. Growth rates and overall health will also be assessed for tree/shrub species within the sampling transects;
- Tree/shrub success criteria shall be based upon survivorship rates of 80 percent or greater for planted and/or naturally recruited species. Survivorship rates within sampling transects will be extrapolated to determine tree/shrub survivorship rates for all mangrove areas;
- The success criteria shall also include a target of 5 percent or less coverage by nuisance/exotic vegetative species within the planting areas. The following information will be included in the time zero and semi-annual monitoring reports:

- (1) A summary of visual field observations, including survivorship and percent coverage data obtained from the above-noted sampling activities;
 - (2) Physical conditions during the monitoring event including weather, wind direction and speed, tide direction, water temperature, and turbidity levels;
 - (3) A photographic record taken from fixed photo stations;
 - (4) Staff gauge water level readings from time period of monitoring activities;
 - (5) Incidental observations of fish/wildlife utilization and sampling for aquatic macrofauna. Fish and macro-invertebrates may be sampled using 1-meter² throw traps;
 - (6) Evaluation of the success of the mitigation, maintenance effort; and
 - (7) Comments and/or recommendations for permit compliance.
- Those agencies receiving and reviewing reports include the Broward County Department of Planning and Environmental Protection, the SFWMD, and the Corps;
 - The maintenance shall be performed quarterly for a period 5 years. A survival rate of 80 percent for the installed tree/shrub species in the mangrove planting areas is anticipated through implementation of the mitigation program;
 - The permittee is responsible for the removal of nuisance and exotic vegetation and debris from the mitigation area for a length of the monitoring period and in perpetuity. Exotic vegetation shall include such species currently listed by the Florida Exotic Pest Plant Council. Nuisance vegetation can include, but is not limited to, such species as primrose willow, saltbush, torpedo grass, and cattail. Mitigation areas shall be free from exotic/nuisance vegetation immediately following a maintenance activity. Total coverage of exotic and nuisance species shall not exceed 5 percent between maintenance activities;
 - Maintenance may be conducted quarterly and will use appropriate methods of control which include, but not necessarily limited to, cutting, mowing, chemical treatment, hand-removal, or any combination thereof;
 - Upon completion of the required monitoring period, Broward County Parks and Recreation Department will be responsible for the perpetual maintenance and management of the mitigation areas (Miller Legg & Associates, Incorporated 2001); and
 - In addition to the above, the Service recommends that the Estuarine Wetland Rapid Assessment Procedure (EWRAP) be used as an additional tool to gauge mangrove restoration success. Baseline scores are available from the Service.

5.3.5 High and Low Relief Hardbottom and Coral Reef Mitigation

Direct impacts to reef and hardbottom habitats would be mitigated for by the creation of artificial reef habitat at a 2:1 ratio for high relief reef habitat and 1.3:1 ratio for low relief reef habitat. Mitigation reefs would be constructed in two different designs, to reflect the differences in the habitat structure of the two types of reef/hardbottom habitat to be impacted. The proposed mitigation would be type for type, to reflect the ecological differences between the different reef types impacted. A total of 19.36 acres of low relief/low complexity (LRLC) reef would be created to mitigate for the new low relief reef habitat (7.48 acres for new low relief habitat and 11.88 acres for previously impacted low relief habitat). A total of 21.64 acres of high relief/high complexity (HRHC) reef would be created to mitigate for the high relief impact.

5.3.6 Hardbottom reef and coral reef mitigation plan

The monitoring plan for the created reefs, consists of both physical and biological components. Physical monitoring will assess settling of reef materials, while biological monitoring will assess populations of algae, invertebrates, and fishes, as compared to control sampling of nearby natural reefs. Monitoring would be conducted annually in the summer months. In order to supplement quantitative monitoring, each sampling effort would include a video taken along transects within the area of the mitigation reefs. The mitigation reef monitoring plan, tailored in design and protocols after Broward County's on-going artificial reef monitoring program, is also associated with the Broward County Shoreline Protection Project mitigation. Currently, the Service is working with an interagency team known as the Port Everglades Reef Group is scheduled to meet to address details of mitigation reef siting, design, and monitoring. The initial proposal consists of the following:

1. Five randomly selected locations on each type of mitigation reef will be used as photoquadrat stations to assess sessile invertebrate and algae abundance. Randomly selected stations on high and low relief natural hardbottom reefs will also be established to serve as controls. Locations for a half square-meter photoquadrats will be marked using steel pins and Differential Global Positioning System. Invertebrate and algal abundance will be evaluated from digital photography of each quadrat. Species will be identified to the lowest practical taxon and ranked in order of abundance. Superimposing a grid over the digital image and counting bare and colonized grid squares will assess overall percent cover (Bohnsack 1979). Criteria for success of the mitigation reef will be based upon a comparison of a total percent cover of algae and invertebrates at the new reefs and at control reefs of corresponding relief type. The criteria for success of the mitigation reefs in establishing a similar community structure will be a finding of no significant difference in the rank abundance orders of species between mitigation and control reefs of each type. Statistical comparisons between mitigation and control reefs will be made using the Wilcoxon Rank-Sum (Zar 1984) or similar nonparametric test at $p = 0.05$.
2. Fish population evaluations will be based on visual censuses conducted separately on HRHC and LRLC mitigation reefs and high and low relief control reefs. The point-count

method (Bohnsack and Bannerot 1986) will be used for fish assessment. This method has the advantage of gathering quantitative data in a relatively short time in a very repeatable pattern that is relatively insensitive to differences in habitat structure. Each census will have a duration of five minutes and a radius (the distance from the stationary observer) of 10 feet. Ten censuses will be collected on each of the four reef types. Data from these types of censuses is rarely normally distributed, so the Wilcoxon Rank-Sum or a similar nonparametric test will be used for significance testing. The criteria for mitigation reef success will be a finding of no significant difference at $p = 0.05$ between reef type pairs (HRHC vs. high relief control and LRLC vs. low relief control).

3. Results of all mitigation-reef monitoring efforts would be summarized in an annual report to be completed by December 31 of each year the monitoring program is in place. Copies of the report will be distributed to all concerned agencies and interested parties.
4. Anchors are placed to both sides of the dredge to provide the ability to swing the dredge. The anchors are placed using a crane on a workboat. Implementation of an anchoring and vessel operation plan to effectively minimize anchor and cable impacts to hardbottom habitat would occur through the Request for Proposal (RFP) process and would include incentives to encourage potential contractors to avoid reef impacts. The evaluation criteria in the RFP would consider the technical aspects of the contractor's proposal as the most significant factor. As a result, the vessel operational and anchoring plan that best avoids or reduces impacts to reefs would receive the highest evaluation and the incentives that follow. Potential ideas provided by coordination with the Department of Environmental Resources Management, dredging companies, and other consultants that would probably appear in contractor proposals for evaluation during the RFP process include:
 - Use of surge buoys along the anchor cable to help lift it up off the reef areas during dredging operations to minimize the area impacted by the anchor cable; and
 - Restricted anchor placement, which restricts placement of the anchors for the cutter-suction dredge to within the channel edge limits. That method reduces impacts but almost doubles dredging time since only half of the channel can effectively be dredged at one time.

6.0 EVALUATION OF THE RECOMMENDED PLAN

The evaluation of the Recommended Plan (Alternative 7) examines the likely impacts of project activities to fish and wildlife resources. In addition, both direct and indirect effects on resources are predicted. Effects on habitats are discussed through examining biological communities, while effects of the project on important fish and wildlife taxa, such as protected species and managed species, are discussed in subsequent sections.

6.1 Fish and Wildlife Resources

As stated earlier, the Recommended Plan would impact 11.55 acres of mangrove wetlands, 0.99 acres of seagrass habitat within the existing channel, 4.01 acres of seagrass habitat outside of the existing channel, 14.89 acres of low relief reef habitat, 10.82 acres of high relief reef habitat, 218 acres of unvegetated bottom habitat, and EFH. Mixed and monoculture beds (2.44 acres) of Johnson's seagrass would also be impacted by the recommended alternative. The Corps anticipates the impacts will be temporary, as much of the habitat would either recover or be replaced. The Recommended Plan would also impact water quality by causing increased turbidity during construction activities, although these impacts would be temporary. Mitigation for seagrass, mangrove, and unvegetated bottom habitat is proposed by creating and enhancing mangrove and seagrass habitat at West Lake Park immediately south of the project site. Artificial reef habitat creation is proposed to offset impacts to high and low relief reef habitat.

6.1.1 Coastal Strand

Though impacts to the beaches in the project area are not anticipated, 15.64 acres of coastal strand uplands will occur due to the required relocation and reconstruction of the USCG boat basin and associated facilities. Impacts due to Elements S-5A (modified) and S-9 will occur mostly on previously impacted Port property and canal banks dominated by invasive species, whereas Element S-1B (modified) (1.45 acres) will affect John U. Lloyd SRA lands comprising both invasive species and native coastal scrub communities.

6.1.2 Mangroves

6.1.2.1 *Direct Impacts*

Service biologists examined project area mangrove wetlands on September 12, 2001, to characterize habitat quality and composition. With this information, an EWRAP was completed post-inspection by the Service, to assist in determining functional level of these wetlands (Appendix B). Table 6 lists mangrove impacts based on habitat type and project element.

6.1.2.2 *Indirect Impacts*

Removal of mangrove trees may indirectly impact adjacent land by destabilizing sediments, and dislodging adjacent roots and pneumatophores, potentially destroying additional trees. If these alterations significantly alter substrate elevation and hydrology of microhabitats, various opportunistic invasive species such as Brazilian pepper may proliferate.

The proposed project would allow larger vessels and a greater number of vessels to pass through channels adjacent to mangroves. Increased wave/current energy could prevent propagule establishment, and may impact shallow root systems (Odum and McIvor 1990). In addition, waves prevent the accumulation of fine sediment, which would create anaerobic conditions typical of mangrove substrates, and hence increase the likelihood of vascular plant competition (Mitsch and Gosselink 1986), including exotics. The Recommended Plan does not clearly

indicate if there will be a replacement of the riprap breakwaters that exist to buffer these effects along the west shore of John U. Lloyd SRA. However, the Corps has proposed to construct a submerged environmentally seawall to avoid indirect impacts to mangroves as a result of side slope sloughing along the south side of the DCC, the western boundary of John U. Lloyd SRA of the SAC, and the TN.

Other indirect impacts may occur from bulkhead construction along the DCC. Bulkheads may cause a decrease in water quality and increase erosion (wave reflection and sediment suspension) for to West Lake Park mangroves south of the Canal.

6.1.3 Seagrass Beds

6.1.3.1 Direct Impacts

The Recommended Plan includes the permanent removal of 5.0 acres of seagrass habitats, 0.99 acre within the existing channel and 4.01 acres outside of the existing channel. The Corps anticipates recolonization of *H. decipiens* within the OEC and other channels. The Service believes that post construction depths of the channels will likely limit recolonization of the species. Seagrass species that are most likely to be adversely impacted in other channels include *H. decipiens*, *H. wrightii*, and *H. johnsonii*. These beds are patchy with less than 5 percent coverage and average density values of 0.32, 0.31, and 0.14, respectively (DC&A 2000).

Dredging efforts to deepen and widen the DCC and a section of the AIW for project implementation will include the removal of approximately 0.76 acre of seagrass habitat. These seagrass beds occur along the southern side of the DCC, near a tidal creek, and in the AIW south of its juncture with DCC. Seagrass in the DCC is very patchy with coverage of 0.1000 (less than 5 percent) and a density of 0.0031 (DC&A 2000). Another seagrass bed of similar composition was found in the area where a proposed small turning basin is proposed in the AIW.

In general, seagrass destruction results in loss of refugia and foraging habitat for many invertebrate and vertebrate species, including both protected and managed species. Removal of seagrasses also affects the ecosystem by impeding important processes and functions such as sediment stabilization, nutrient cycling, and oxygen production. In addition, proposed activities will destroy seagrass beds comprising a federally threatened species, Johnson's seagrass.

6.1.3.2 Indirect Impacts

Seagrass beds located adjacent to the MTB, along the eastern shore of the SAC, within the AIW south of the DCC intersection, and in a tidal creek just south the DCC are subject to indirect impacts. Elements S-1B (modified) and S-5A (modified) will likely have greater indirect impacts on seagrass habitats within and adjacent to the project area than Elements S-8 and S-9. The former two elements involve removal of greater volumes of sediment, and involve areas that are situated adjacent to beds that are not proposed for removal. Some of these beds that will be indirectly affected include the threatened Johnson's seagrass.

Indirect effects to seagrass habitat due to dredge activities in the project area may be long-term or temporary, depending on the degree of disturbance and the length of the interval over which the disturbance occurs. Should dredging activities result in re-suspension of high concentrations of fine sediments into the water column, tides and currents may transport these sediments over adjacent seagrass beds where they may be deposited. Potential indirect losses of habitat or a temporary reduction in seagrass productivity and habitat quality may result. Another indirect effect that dredging may have would be the change in benthic hydraulics, or the manner in which currents move over the substrate. Deepening areas adjacent to seagrass beds may alter how currents pass through beds, and thereby change patterns of sediment deposition and other physical variables.

6.1.4 Unvegetated Softbottom Habitats and Rock/Rubble Habitats

The majority of benthic habitat proposed to be dredged is categorized as either softbottom habitat lacking seagrasses or rock/rubble habitats lacking coral communities. These habitats are dominated by a wide variety of substrates, from silt and clays to sand and gravel to rocks and rock outcrops. In many cases, scattered rubble remains from previous dredging activities. Examples of areas including these habitats are the SAC, the DCC, all turning basins, and the majority of the IEC. Therefore, all project elements will directly impact softbottom and rock/rubble habitats. The majority of these habitats proposed for dredging have already been dredged at some time in the past, but there are other areas that are proposed to be dredged for the first time.

Direct impacts to softbottom and rock/rubble communities would result from the removal of benthic organisms and dredged material that contains benthic infauna. In some of the more diverse habitats, sponge-algae communities with interspersed colonial organisms may be destroyed. However, in deeper areas, or where fine silt and silty sand are dominant, these habitats are of lower quality for infauna and are believed to play a less significant role in terms of primary and secondary productivity in the project area.

Impacts to populations of epibenthic fauna and benthic infauna is expected to be temporary in previously dredged areas, as existing depths are presently from 38 to 44 feet. Recolonization by opportunistic species should occur within several months, with significant recovery of present fauna in one to two years. However, impacts to benthic fauna of existing shallow undredged areas, from the proposed dredging, are expected to be permanent and detrimental. Natural shallow water habitat will significantly change in character and productivity to communities colonizing and utilizing unnatural deep dredge channels and basins within this estuary. This degradation was recognized in the planning and implementation of the Fort Pierce Harbor Navigation Improvement Project of the 1990s.

The Service has not been provided data associated with shallow sandy bottom habitat in the project area, however, studies of similar habitat in the Fort Pierce Harbor area by DEP, Continental Shelf Associates, and Harbor Branch Oceanographic Institute in the early 1990s

indicate a diverse and productive faunal assemblage (Service 1994). Benthic macroinfauna accumulate and cycle nutrients and energy, providing food chain support and a direct food source for epibenthic and ichthyofaunal species. The DEP reported both a high number of infaunal organisms (357) and a high number of taxa (51) in their sampling. Continental Shelf Associates reported sampling station taxa ranging from 47 to 75, a Shannon Diversity Index of 2.42 to 3.49, and 12,045 to 66,666 individuals per square meter. Harbor Branch Oceanographic Institute provided species listings, as well, in the FWCA for this project. Function and value of this type of habitat existing in the action area of Port Everglades are expected to be similar. Approximately 42 acres of shallow bottom will be permanently lost by dredging in the Port's Recommended Plan.

Another direct impact of removing shallow sandy bottom is the loss of suitable substrate for seagrasses. Seagrass coverage and species composition is ephemeral in habitats such as these, changing seasonally and from year to year.

6.1.5 High and Low Relief Hardbottom Reef and Coral Reefs

6.1.5.1 Direct Impacts Inside the Existing Channel Zone

Direct impacts to hardbottom and coral reef communities will occur as a result of the dredging process to deepen and widen the OEC. There will be 19.96 acres of impact to reef habitat within the existing channel including 9.14 acres of low relief reef and 10.82 acres of high relief reef. In addition, the proposed project will impact established hardbottom habitat on the limestone walls of the existing channel, where approximately 0.29 acre will be impacted. Inshore channel walls (*i.e.*, within the AIW) also function as hardbottom. Approximately 1.89 acres of inshore wall habitat will be impacted by the widening of the Widener and SAC (a section of the AIW).

Hard substrates such as outcrops, rocks, and exposed hardbottom, and associated reef biota, form the backbone of a diverse, and economically and ecologically important ecosystem. Therefore, impacts to habitats within the existing channel are significant. Although these live-bottom habitats have been dredged in the past, their value to fish and wildlife is considerable. Assemblages of sessile organisms in previously dredged areas may recover and reach a functional value of hardbottom habitats similar to those currently found in the channel in approximately 10 to 15 years.

6.1.5.2 Direct Impacts Outside the Existing Channel Zone

Approximately 5.75 acres of previously undredged low relief coral reef habitat will be impacted by widening and extending the OEC.

The coral reef forming the outermost tract is one of the most important coral reef resources in southeast Florida. Its distance from shore and the harbor result in increased health and less disturbances in comparison to the other two reef tracts. Impact to the reef habitat at the end of the OEC would result in direct removal of many coral species including a high density of

gorgonians. These coral species provide an important habitat for many fish and other invertebrate species. Impacts to this reef habitat will decrease the offshore ecosystem's carrying capacity for many reef-dependent invertebrate and vertebrate species, including managed species. Therefore, loss of coral reef habitat may result in changes at the population level for many species, and possibly an overall change in fish community structure. Individual coral colonies, which may have taken over 100 years to grow to present size, would be lost. With relocation of existing hard corals of six inches or greater, most of the ecological functionality of the remaining coral and sponge assemblages in these undredged areas may return in less than 30 years.

6.1.5.3 Indirect Impacts

Indirect impacts to dredging hardbottom and reef habitat may include temporary changes in adjacent habitats. In particular, reef and hardbottom habitats just outside the new entrance channel may be affected. Potential indirect impacts may include the re-suspension and deposition of sediments on nearby coral reef assemblages. This re-suspension of sediments may also result in temporary periods of increased turbidity within the area. The temporary effects of this turbidity may include a temporary loss of photosynthetic activity on the reef.

Other indirect effects include the displacement of fishes and invertebrates during dredge operations. Disturbances and physiological impacts caused by the acoustic and pressure effects of blasting are not easily anticipated, and may injure or kill proximal individuals.

6.1.6 Essential Fish Habitat

EFH present in the project area includes seagrass beds, hardbottom, reefs, inshore softbottom habitats, the water column, and beds of the red alga genus *Laurencia* (SAFMC 1998a). With the exception of water column habitat and algae beds, anticipated loss of these habitats due to project implementation is quantified in Section 6.1. Decreases in EFH, particularly high-quality habitat and those designated as HAPC, would affect populations of managed fish and invertebrate species.

The most obvious direct impact of the Recommended Plan on managed species in all habitats is the potential for mortality and/or injury of individuals through the dredging and/or blasting processes. Species in any and all of the project area's habitats are susceptible. Fishes and invertebrates are at risk at any life-history stage; eggs, larvae, juveniles, and even adults may be inadvertently killed, disabled, or undergo physiological stress, which may adversely affect behavior or health. Forms that are less motile, such as juvenile shrimp, are particularly vulnerable (they would be sucked into the dredge apparatus, or otherwise directly removed from their habitat).

Blasting will also have a direct impact on managed fish species residing in/migrating through the harbor and associated waterways. Previous studies (Corps 2000b, Keevin and Hempen 1997, Young 1991) have addressed the impacts of blasting on fishes. Fishes with air bladders are particularly more susceptible to the effects of blasting than aquatic taxa without air bladders (e.g., shrimp, crabs, etc.), which are more resistant to the impacts of blasting (Keevin and Hempen

1997). Fish species that are relatively small in size and/or exhibit territorial behavior, are most likely to impact during blasting.

Although dredge operations are likely to directly impact individuals of managed species in observable lethal and sublethal manners, dredging and blasting may have more subtle adverse effects. These subtle effects act on individuals, but may be perceived only at the population level. For example, dredging/blasting activities, particularly in linear corridors (such as Cut 3 and Fisherman's Channel) may interfere with migration patterns of species that require utilization of both inshore and offshore habitats through ontogeny. This is a particular concern for species that travel along shorelines and bulkheads. Therefore, dredging berths and littoral zone habitats is anticipated to have greater effects. These impacts may result in displacement of individuals or disjuncture in the life-cycles of managed species.

Impacts to the water column can have widespread effects on marine and estuarine species. Hence, it is recognized as EFH. The water column is a habitat used for foraging, spawning, and migration by both managed species and organisms consumed by managed species. Water quality concerns are of particular importance in the maintenance of this important habitat. During dredging in substrates comprising coarser materials and rock, water quality impacts are expected to be minimal. However, where silt and/or silty sand are to be dredged, water quality impacts are expected to be significant, and take several weeks/months after cessation of dredging activities to return to background levels. Re-suspended materials will interfere with the diversity and concentration of phytoplankton and zooplankton, and therefore affect foraging success and patterns of schooling fishes and other grazers that comprise prey for managed species. Recent efforts to quantify the dredging impact area incorporate only the waters directly above dredged substrates. However, due to the physical properties of water and the complex hydraulics operating within the harbor and channels, these efforts greatly underestimate the extent of negative effects of dredging.

Adverse impacts to EFH, such as seagrass beds, inshore softbottom, mangroves, hardbottom, and coral reefs result in the loss of substrates used by managed species for spawning, nursery, foraging, and migratory/temporary habitats. The most critical losses of EFH would be those areas additionally designated as HAPC. Coastal inlets are HAPC for shrimps, red drum, and grouper. Inlets are important for these species that prefer estuarine, inshore habitats such as mangroves, seagrass beds, and mudflats. Medium- and high-profile reefs are also considered HAPC for grouper, and the hardbottom existing in 0 to 4 meters of depth off of Broward County is listed as HAPC for corals and coral reefs (SAFMC 1998b).

Significant losses to EFH-HAPC within the area proposed for dredging include destruction of seagrass beds and coral reef. Isolated seagrass beds provide important habitat, but seagrasses in the project area are even more important due to their proximity to reef and hardbottom habitats. Their function is intimately coupled with reefs to provide life-stage-specific habitat for certain managed species. Loss of these two habitats (reef and seagrass) will result in a loss of habitat critical in the spawning and early life-stages for species of the snapper-grouper complex, which consists of 73 species that commonly use the inshore habitats for part of their life cycle. These

include bluestriped grunts, French grunts, mahogany snapper, gray snapper, yellowtail snapper, and red grouper.

Seagrass beds are also intimately coupled with mangroves. These mangrove areas serve a nursery for many managed species including pink shrimp, spiny lobster, and members of the snapper-grouper complex, many of which also rely on seagrass habitats at certain phases during ontogeny.

Impacts to populations of managed species will occur due to dredging softbottom habitats, including those that lack seagrasses. Dredging will remove benthic organisms used as prey by managed species and as a result may temporarily impact certain species, such as red drum, that forage largely on such taxa. Dredged habitats are anticipated to recover, in terms of benthic biodiversity and population density, within 2 years.

Populations of recreationally and commercially important fish species may be affected by turbidity, which may alter the algae and plankton assemblages of the harbor, channels, and nearshore habitats. Entire food webs rely on specific types of algae and plankton. Their absence or decrease in concentration could alter primary consumer populations and cause a ripple effect throughout each trophic level in the food chain.

6.2 Threatened and Endangered Species

The Corps has determined that the proposed expansion and deepening of the Port Everglades Harbor as described in the Recommended Plan “may affect, but is not likely to adversely affect” the endangered West Indian manatee, endangered American crocodile, endangered green sea turtle, threatened loggerhead sea turtle, endangered Kemp’s ridley, endangered hawksbill sea turtle, and endangered leatherback sea turtle, endangered smalltooth sawfish, and endangered whale species which are known to occur along the Atlantic Coast. Possible adverse effects to these species during construction include injury, mortality, or harassment and may affect the life history of these species as a result of the loss or modification of habitats via dredging and/or blasting associated with construction. Indirect impacts would include effects to nearby habitats or species within nearby areas either during dredging, spoil deposition, or blasting activities as a result of turbidity or sedimentation.

6.2.1 Sea Turtles

Beaches along John U. Lloyd SRA provide nesting habitat for federally listed sea turtle species as discussed previously. In addition, other resources comprise important habitats for turtles. Removal of sections of hardbottom, reef, and seagrass habitats will eliminate potential foraging habitat for juvenile and adult turtles and refugia for hatchlings. Also, dredge activities and associated disturbances (noise, lights, etc.) offshore may interrupt the movement of turtles swimming toward or away from nesting beaches to the north or south. Specifically, the highest potential impact to sea turtles may result from the use of explosives to break/dislodge rock substrates in offshore channels. Threshold lethal pressures for sea turtles are probably similar to

those of marine mammals (U.S. Department of the Navy 1998, as cited in Corps 2000b). Therefore, turtles in the immediate vicinity of any detonation site would likely be killed, and individuals existing within 400-600 feet of the blast would likely suffer injury. Additional information is provided in Effects of Blasting below.

Another possible element of the action that may affect sea turtles is the presence of light and/or noise from construction/dredging vessels anchored offshore. These factors may interrupt the movement of adult, nesting, female turtles swimming toward or away from nesting beaches, and may cause disorientation of hatchlings following emergence. However, since the Port is an active facility, offshore lighting is not an unusual feature of the area, and should not appreciably change the ambient conditions of nesting areas in the vicinity of the action. In addition, all construction/dredging vessels are required to adhere to best management practices, such as preventing lights from exposure to shore through use of shields. Therefore, no adverse indirect impacts to sea turtle nesting habitat due to dredging operations are anticipated for the proposed action.

6.2.2 West Indian Manatee

The Service reviewed a biological assessment from the Corps dated March 25, 2002, in which the Corps determined the project “may affect, but is not likely to adversely affect” the endangered West Indian manatee. In response, the Service stated that we could not concur with this determination based on the blasting protection measures proposed at that time. During consultation regarding blasting, the Corps agreed to implement the same blasting protection measures and monitoring procedures as proposed for the expansion of the Port of Miami and deepening of the Lummus Turning Basin (Miami Harbor, Phase II), known as the Navy Diver Protocol, plus an additional 500 feet to the safety zone. Furthermore, the Corps agreed to revise the blasting protection measures should the results of the Miami Harbor Phase II indicate the need based on input from State, Federal, and local governmental agencies. In addition, the Corps has agreed to avoid blasting activities during the winter (November 15 to March 15), when manatees typically are present in greater numbers. Based on this information, the Service concurs with the Corps’ “may affect, not likely to adversely affect” determination.

The Service has not been able to obtain information to quantify manatee mortality by larger commercial vessels. Historically, Port Everglades has taken steps to reduce manatee-human interaction, injury and mortalities within the Port. These steps have included: (1) posting manatee warning and speed zone signs throughout the Port; (2) posting the former “EPA slip” in the FPL discharge canal as a “Manatee Nursery Area” to restrict boaters and the general public; (3) developing and implementing a manatee protection plan for dredging activities; (4) developing and implementing a manatee protection plan for blasting activities; (5) deepening Manatee Lagoon to allow manatees to utilize the area during all tidal stages and increase the flow of warm water; (6) installing floating barricades and signs to prevent access to the manatee nursery area; (7) providing Lagoon Protection at the John U. Lloyd SRA; (8) funding manatee research within the Port by the Service, the Miami Seaquarium, and other researchers including Wilcox, Reynolds, and Fletemeyer; (9) participating in law enforcement to prevent harassment of manatees by swimmers; (10) sending letters to all tug captains prior to manatee season.

(November 15 – March 31) to remind them of the upcoming season and manatee protection measures; (11) placing fenders approximately four feet in width throughout the entire Port at 50 foot centers to prevent manatees from being crushed between the ships and the bulkheads; and (12) developing outreach programs and materials such as brochures, seminars and public presentations.

Table 7 shows the annual number of manatee deaths in Broward County as a result of various causes during a 28 year period. The Corps states in their biological assessment that increasing the Port size will not have an adverse effect on manatees because data show that manatees are not using the Port as a primary habitat. Aerial surveys conducted between 1988 and 1992 show that very few manatees prefer the Port area. Manatees aggregate in the Port Everglades power plant canal, as well as in a berth known as the “EPA slip.” The Port has developed a manatee protection plan which includes the placement of 4 foot wide bumpers along the slips to hold ships 4 feet away from the bulkheads, thus reducing the potential for a manatee to be crushed by a ship. In addition, regulations drafted by the State require ships to travel at the slowest speed possible to maintain steerage.

6.2.3 American Crocodile

The Service concurs with the Corps determination that the proposed project “may effect, but is not likely to adversely affect” adults, hatchlings, and/or juveniles of the American crocodile during dredging or blasting operations adjacent to West Lake Park. Since the implementation of protection measures designated to minimize possible adverse effects to frequently observed listed species such as the manatee and sea turtles, these provisions will include the American crocodile.

6.2.4 Johnson’s Seagrass

Dredging will result in the removal of approximately 1.79 acres of seagrass beds, where *H. johnsonii* is the sole constituent or associate of other seagrass species, in the AIW and DCC. Changes in bottom depth through deepening and widening efforts within the Port are expected to make habitats unsuitable for re-colonization of *H. johnsonii*. It is not known if *H. johnsonii* in areas adjacent to dredging zones would be resilient to changes in water quality or to impacts resulting from deposition of sediments on blades. Since this species is extremely limited in range, and relatively little is known about its biology and ecology, any destruction of plants, especially where monospecific beds are involved, is a critical loss. There are only seven seagrass species known in Florida. According to the Federal Register (April 3, 2000, 65:17786-17804), no areas within the project area have been designated as critical habitat for the species.

6.2.5 Smalltooth Sawfish and Other Protected Fish Species

Although seagrass and other softbottom habitats will be removed, the Corps does not anticipate that the proposed project will have any indirect effects on smalltooth sawfish in the vicinity of the action area. These habitats may be utilized by the species. However, loss of seagrass habitats is relatively small with respect to nearby resources, and will be compensated through mitigative measures. Nearshore softbottom areas are also plentiful in and near the action area, and impacts

to them would not limit resource use by sawfish, especially since population density of individuals in the area is extremely low, or nil.

Protected species such as the mangrove rivulus, common snook, and smalltooth sawfish would lose valuable habitat (mangroves, seagrass flats, nearshore softbottoms, etc.) if project elements are carried out. Populations may also be affected by turbidity, which may alter the algae and plankton assemblages of the harbor, channels, and nearshore habitats. Entire food webs rely on specific types of algae and plankton. Their absence or decrease in concentration could alter primary consumer populations and cause a trophic “ripple” up the food chain. The smalltooth sawfish may be affected through dredging nearshore areas in channels that are currently suitable habitats (areas of sand and/or mud bottoms less than 30 feet in depth).

6.2.6 Whales and Dolphins

Adverse effects to species of marine mammals, particularly resident populations of dolphins within the project area, may occur during blasting activities. These effects are described below.

6.3 Effects of Blasting

The highest potential for direct impacts to threatened and endangered marine mammal species may result from the use of explosives to break/dislodge rock substrates in Fisherman’s Channel, where manatees are known to congregate during winter months. Both the pressure and noise associated with blasting can injure marine mammals. Noise and pressure effects on manatees have not been well documented, however, it is assumed that manatees will be impacted similar to dolphins. For the current project, there is a risk that both taxa may be affected during the proposed blasting activities.

Direct impacts on marine mammals due to dredging/blasting and construction activities in the project area include alteration of behavior and autecology. For example, daily movements and/or seasonal migrations of manatees and dolphins may be impeded or altered. In addition, marine mammals may alter their behavior or sustain minor physical injury from detonation of blasts outside the 600-foot safety zone. Although incidental take would not result from sound/noise at this distance, disturbances of this nature (alteration of behavior/movements) may be considered harassment under MMPA and ESA. These are special concerns for resident populations of manatees and bottlenose dolphins.

The use of blasting to break apart substrates in offshore areas, particularly at the outermost reef, is strongly discouraged. Effects of blasting on managed/protected reef and pelagic species would be detrimental (at the individual and population levels), and it is likely that non-target reef structures will be damaged, and there will be direct mortality of fishes up to 140 feet away from each charge (Keevin and Hempen 1997) and turtles and marine mammals up to 400 feet away from each charge. Conducting a test blast with subsequent biological monitoring would help the Service appraise what damages would be to local fish populations, and allow for exploration of mitigative measures that may be employed to decrease impacts. Mortality of sea turtles and

marine mammals can be generally eliminated by ensuring that none pass within 600 feet of the discharge.

Utilizing data from rock-contained blasts such as those at Atlantic Dry Dock North Carolina, the Corps has been able to estimate potential effects on protected species. These data can be correlated to the data from the Environmental Protection Agency (EPA) concerning blasting impacts to marine mammals. The EPA data indicate that impacts from explosives can produce lethal and non-lethal injury as well as incidental harassment. The pressure wave from the blast is the most causative factor in injuries because it affects the air cavities in the lungs and intestines. The extent of lethal effects are proportional to the animal's mass, *i.e.*, the smaller the animal, the more lethal the effects; therefore all data are based on the lowest possible affected mammal weight (infant dolphin). Non-lethal injuries include tympanic membrane rupture; however, given that dolphin and manatee behavior rely heavily on sound, the non-lethal nature of such an injury is questionable in the long-term. For that reason, it is important to use a limit where no non-lethal tympanic membrane damage occurs. Based on the EPA test data, the level of pressure impulse where no lethal and no non-lethal injuries occur is reported to be 5 pounds per square inch pressure during an exposure lasting 1 millisecond.

George Young (1991) noted the following limitations of the cube root method:

Doubling the weight of an explosive charge does not double the effects. Phenomena at a distance, such as the direct shock wave, scale according to the cube root of the charge weight. For example, if the peak pressure in the underwater shock wave from a 1-pound explosion is 1000 pounds per square inch at a distance of 15 feet, it is necessary to increase the charge weight to approximately 8 pounds in order to double the peak pressure at the same distance. (The cube root of eight is two.)

Effects on marine life are usually caused by the shock wave. At close-in distances, cube root scaling is generally valid. For example, the range at which lobster have 90 percent survivability is 86 feet from a 100-pound charge and double that range (172 feet) from an 800-pound charge.

As the wave travels through the water, it reflects repeatedly from the surface and seabed and loses energy becoming a relatively weak pressure pulse. At distances of a few miles, it resembles a brief acoustic signal. Therefore, shock wave effects at a distance may not follow simple cube root scaling but may decline at a faster rate. For example, the survival of swim bladder fish does not obey cube root scaling because it depends on the interaction of both the direct and reflected shock waves. In some cases, cube root scaling may be used to provide an upper limit in the absence of data for a specific effect.

More recently, studies by Finneran et al. (2000) showed that temporary and permanent auditory threshold shifts in marine mammals were used to evaluate explosion impacts. Due to the fact that marine mammals are highly acoustic, such impacts in behavior should be taken into account when assessing harmful impacts. While many of these impacts are not lethal and this study has

shown that the impacts tend not to be cumulative, significant changes in behavior could constitute a “take” under the MMPA.

The effects of blasting on sea turtles and the smalltooth sawfish are described as follows. There have been studies that demonstrate that sea turtles are killed and injured by underwater explosions (Keevin and Hempen 1997). Sea turtles with untreated internal injuries would have increased vulnerability to predators and disease. Nervous system damage was cited as a possible impact to sea turtles caused by blasting (U.S. Department of Navy 1998). Damage of the nervous system could kill sea turtles through disorientation and subsequent drowning. The Navy’s review of previous studies suggested that rigid masses such as bone (or carapace and plastron) could protect tissues beneath them; however, there are no observations available to determine whether the turtle shells would indeed afford such protection. Studies conducted by Klima et al., (1988) evaluated blasts of only approximately 42 pounds on sea turtles (four ridleys and four loggerheads) placed in surface cages at varying distances from the explosion. Christian and Gaspin’s (1974) estimates of safety zones for swimmers found that, beyond a cavitation area, waves reflected off a surface have reduced pressure pulses; therefore, an animal at shallow depths would be exposed to a reduced impulse. This finding, which considered only very small explosive weights, implies that the turtles in the Klima et al. (1988) study would be under reduced effects of the shock wave. Despite this possible lowered level of impact, five of eight turtles were rendered unconscious at distances of 229 to 915 meters from the detonation site. Unconscious sea turtles that are not detected, removed and rehabilitated likely have low survival rates. Such results would not have resulted given blast operations confined within rock substrates rather than unconfined blasts. The proposed action will use confined blasts, which will significantly reduce the area around the discharge where injury or death may occur. The Corps assumes that tolerance of turtles to blast overpressures is approximately equal to that of marine mammals (Department of the Navy 1998), *i.e.*, death would not occur to individuals farther than 400 feet from a confined blast (Konya 2001).

Review of ichthyological information and test blast data indicates that fishes with swim bladders are more susceptible to damage from blasts, and some less-tolerant individuals may be killed within 140 feet of a confined blast (Corps 2000b). Sawfishes, as chondrichthyans, do not have air bladders, and, therefore, they would be more tolerant of blast overpressures closer to the discharge, possibly even within 70 feet of a blast.

Due to conservation safeguards that will be incorporated into the project design, the Corps does not anticipate adverse effects to either sea turtles or sawfish. To avoid or minimize any possibility of direct impacts, blasting is not anticipated to occur offshore where mature females may be migrating to nesting areas in the county. Risk to sawfish will likely be minimal as there are no historic or recent records of the species in the project area.

6.4 Additional Concerns Affecting Fish and Wildlife Resources

6.4.1 Contaminated Sediments

Besides typical concerns associated with contaminants from water-based operations and surface water runoff common to marinas and ports, groundwater sampling on Port Everglades property confirms large areas of gross contamination, reportedly due to storage tank leakage.

Observations are documented of significant standing petroleum “free product” floating and mixing on the groundwater table. We understand that although there is a free product recovery initiative, funding has been inadequate for remediation. Underground seepage and introduction into the Port’s waters through a variety of pathways is expected, as is the fallout and adsorption of metals and other fuel elements by underlying sediments. This Port concern is in addition to the suspected elevated contaminants levels in the DCC possibly from this situation, as well as from marinas and the Fort Lauderdale-Hollywood International Airport upstream.

Dredging will cause fine particulate material to become suspended, the magnitude of which depends on dredging methodology. If present in sediments, both pelagic and benthic species may be exposed to a number of petroleum-based contaminants. Various lethal and sublethal effects may result, based on the type and concentration of contaminant and duration of exposure.

The *Port Everglades Harbor Marine Protection Research and Sanctuaries Act Tier 1 Evaluation of Dredged Material Disposal* (Corps 2002) states that virtually all sediments tested had one or more chemical parameters with concentrations that were higher than reference sediments; therefore, further testing is needed.

The Service has also reviewed documents provided by the Corps on March 7, 2002, entitled Chemical and Biological Test Data, Port Everglades Harbor, Florida. Generally, laboratory detection limits utilized for several pesticides, mercury, and cyanide are too high to properly evaluate for potential effects to Service trust resources. Both the Florida Ambient Water Quality Criteria and the Sediment Quality Assessment Guidelines (SQAG) provide screening values based on documented toxicity to invertebrates for freshwater and marine environments. Because data presented in the included *Final Report for Port Everglades and Palm Beach Harbor Florida: 1998 Evaluation of Dredged Material for Ocean Disposal* (Final Report) demonstrate detection limits above these criteria, it is not possible to screen these data for the following analytes:

Detection limits are above Florida SQAG (McDonald 1994) criteria for Dichloro-diphenyl-trichloroethane (DDT) and metabolites, Chlordane, Dieldrin, Lindane, and Endrin.

Detection limits are above Florida Ambient Water Quality Criteria (marine surface water: 62-302.530) for DDT, Dieldrin, Endrin, Endosulfan, Methoxychlor, Heptachlor, Toxaphene, Mercury, and Cyanide.

Data in the Final Report for metals, Polycyclic Aromatic Hydrocarbons (PAHs) and Polychlorinated Biphenyls (PCBs) were adequate for screening level evaluation. Sample site E-PE98-4 demonstrated SQAG exceeded levels for copper (threshold effects level) and several

PAHs (threshold effects levels). Sample site E-PE98-1 exhibited threshold effects level exceedances for copper. No sample site demonstrated PCB concentrations in excess of SQAG screening levels.

Bioassay results presented in the report are thoroughly documented and do not indicate toxicity throughout sediment elutriate and sediment bioassays performed for all sample sites.

Although bioassays are an important component in a comprehensive study for the determination of toxicity to fish and wildlife from dredging, adequate empirical chemical (water and sediment) data are also important, especially regarding any efforts to correlate toxicity (indicated by bioassays) with any detectable analyte. Several detection limits in this report were too high to detect levels at, or even to some degree, above ecological screening criteria established for the protection and conservation of fish and wildlife. Had any of the bioassays indicated toxicity, re-sampling and subsequent lab analyses would have been necessary to correlate that toxicity with any contaminant or group of contaminants.

The Service has concerns about the applicability of this data in providing conclusions regarding potential impacts to Service trust resources which could result from the proposed dredging project. The sampling design for the only recent study is limited to a relatively small portion of the overall project. A total of four sample sites was selected within the northern-most portion of the project area, roughly comprising one-fifth of the total area to be dredged. The sampling design does not include the DCC, which appears to have high a potential for sediment bound contaminants due to the industrial and commercial nature of adjacent land uses. Though the Corps has been unable to produce any data for the DCC, the DEP has indicated concern due to contaminant sources upstream of the project area (*e.g.*, marinas and the airport).

Due to the limited extent and detection methods of sampling and analysis, and the uncertainty of spoil transport and stockpile methodology, the Service cannot adequately address spoil disposal impacts to uplands, groundwater, or dewatering.

7.0 SERVICE'S MITIGATION POLICY

Potential impacts of the proposed Port expansion project include the following habitat: unconsolidated benthic habitat, seagrasses, nearshore hardbottom, coral reef, rock/rubble, and channel wall. Impacts may include removal as a result of dredging and/or blasting activities, burial from actual fill placement at mitigation and offshore disposal sites, burial and suffocation from suspension and settling generated from dredging and/or blasting activities, dredged material placement at mitigation site, and damage during construction activities.

In developing the Service's Mitigation Policy (Federal Register 46 (15), Pg. 7656), the definition of mitigation contained in the Council on Environmental Quality's National Environmental Policy Act regulations (40 CFR 1508.20[a-e]) was used. This definition recognizes mitigation as a stepwise process that incorporates both careful project planning and compensation for unavoidable losses and represents the desirable sequence of steps in the mitigation planning process. Initially, project planning should attempt to ensure that adverse effects to fish and

wildlife resources are avoided or minimized as much as possible. In many cases, however, the prospect of unavoidable adverse effects will remain in spite of the best planning efforts. In those instances, compensation for unavoidable adverse effects is the last step to be considered and should be used only after the other steps have been exhausted.

The Service's Mitigation Policy focuses on the mitigation of fish and wildlife habitat values, and it recognizes that not all habitats are equal. Thus, four resource categories, denoting habitat type of varying importance from a fish and wildlife resource perspective, are used to ensure that the mitigation planning goal will be consistent with the importance of the fish and wildlife resources involved. These categories are based on the habitat's value for the fish and wildlife species in the project area (evaluation species) and the habitat's scarcity on a national, regional or local basis. Resource Category 1 is of the highest value and Resource Category 4, the lowest. Mitigation goals are established for habitats in each resource category.

The mitigation goal for Resource Category 1 habitats is no loss of habitat value since these unique areas cannot be replaced. The goal for Resource Category 2 habitats is no net loss of in-kind habitat value. Thus, a habitat in this category can be replaced only by the same type of habitat (*i.e.*, in-kind mitigation). The mitigation goal for Resource Category 3 habitats is no net loss of overall habitat value. In-kind replacement of these habitats is preferred, but limited substitution of different types of habitat (out-of-kind mitigation) perceived to be of equal or greater value to replace the lost habitat value may be acceptable. The mitigation goal for Resource Category 4 habitats (considered to be of marginal value) is to avoid or minimize losses, and compensation is generally not required.

Priority habitats in the project area are seagrasses, nearshore hardbottom, and coral reef. These habitats are considered by the Service to be in Resource Category 2, and no net loss of in-kind habitat value is recommended. However, we consider any significant colonies of hard (stony) coral in this area to be Resource Category 1. Research suggests that two species of brain and star coral grow at a rate of approximately 0.5 centimeter per year. Based on this information, we estimate it would take these corals, and likely other hard coral species, at least 100 years to reach 1 meter in diameter.

7.1 Evaluation of Proposed Mitigation

7.1.1 Mangrove

In 2003, the Corps estimated that 11.55 acres of mangrove would be impacted by the proposed project as a result of side slope sloughing. An EWRAP was performed to evaluate proposed mangrove impact areas and proposed mitigation areas in West Lake Park (Appendix B). Calculations indicate that 20.5 acres of restoration of mangrove habitat on West Lake spoil islands would appear to provide compensatory mitigation for the proposed 11.55 acres of mangrove impacts. It should be noted that EWRAP does not adequately address the benefits that mangroves provide, such as water quality, detrital export, and area aquatic food-base. EWRAP is an evolving modification of South Florida Water Management District's WRAP, which primarily concentrates on the state of the wetland rather than its benefits to neighboring

ecosystems. The peripheral benefits can differ in magnitude depending upon habitat character and location.

To further minimize direct impacts to mangrove habitat, the Corps has agreed to construct submerged environmentally friendly seawalls as part of the current Recommended Plan along the constructed channels along the DCC, SAC, and TN to avoid mangrove impacts caused by side slope sloughing.

The proposed mitigation plan consists of the restoration of mangroves on 9.0 acres of spoil islands in West Lake Park, which the Service considers inadequate. Therefore, the plan will also include stabilizing (*i.e.*, riprap) 22.7 acres of mangrove shoreline stabilization (riprap) and increasing mangrove function in the estuary.

The Service supports the removal of dredged material from the West Lake spoil islands for mangrove restoration. As previously recommended by the Service, the 8.48 acres of mangroves on the west side of the TN should not be dredged since this area was set aside as conservation associated with previous Port expansions. The Service objected to the initial dredging of the TN, involving 18 acres of mature mangrove habitat, in a 1987 letter to the Corps (Appendix A).

7.1.2 Seagrass

The Corps has proposed to mitigate for the direct loss of 5 acres of seagrass through the removal of 8.1 acres of spoil islands in West Lake Park. To adequately compensate for the temporal loss of function and value of 5 acres of seagrass, a minimum replacement ratio of 3:1 should be applied and 15.0 acres of seagrass mitigation should be provided. We recommend a minimum 3:1 ratio due to uncertainties in successful establishment, the presence of threatened *Halophila johnsonii* on impact sites, and the potential lack of adequate seagrass seed source adjacent to the mitigation site. The proposed creation of 8.1 acres of seagrass substrate falls short of a 3:1 ratio. Mitigation ratios aside, the Service first recommends minimization of impacts to seagrasses and the sandy shoals that support, and are capable of supporting seagrass, such as those at the Widener Shoal and immediately south of the nearby marina basin. The Corps should reduce the eastern extent of dredging in these areas. The preservation of some of the shallow benthic habitat in these areas could reduce seagrass impacts to less than two acres, including the Dania Canal area, as growth appears to concentrate nearshore at the Widener Shoal. Appropriate mitigation then could be reduced to less than 6 acres.

The Service supports the proposed mitigation methodology of removal of mounded sediments at three spoil islands and stabilization of shorelines within each excavated area. These spoil areas would be excavated to an elevation consistent with the depths where seagrass beds are present in adjacent habitat along the AIW. In the event that natural recruitment has not occurred within 12 to 18 months following excavation, methods to plant seagrass donor material would be initiated (Fonseca et al. 1998). Shoreline and soil stabilization activities may increase production by reducing turbidity within the estuary. Also, several derelict barges in a tidal creek will be removed, making substrate available for colonization.

7.1.3 Low and High Relief Hardbottom Reefs and Coral Reefs

The Recommended Plan involves the dredging of approximately 30.71 acres of high and low relief reef and hardbottom and coral reef, including 2.18 acres of channel wall habitat. The proposed locations for mitigation reefs include previously permitted Broward County artificial reef sites (Fig. 14). HRHC and LRLC reef designs are illustrated in Figure 15. HRHC relief will range in profile from 3 to 6 feet, whereas LRLC will range from 1 to 2 feet. The HRHC reefs are intended to mitigate for impacts to high relief habitat and the LRLC reefs are intended to mitigate for impacts to lower relief habitat and for temporal impacts to hardbottom habitat previously impacted by channel dredging (DC&A in preparation). Limestone rock excavated from the OEC, IEC, MTB, and STB, and, if necessary, supplemental quarried limestone will be used in reef construction.

8.0 RECOMMENDATIONS

Some elements of the Recommended Plan will have significant impacts on ecosystems within the project area. Specifically, these impacts involve the elimination of portions of mangrove systems, seagrasses, shallow benthic habitats, and live hardbottoms including corals. The Service recommends that all efforts to avoid these impacts be thoroughly investigated, and that alternative means of carrying out project objectives be considered through modifications of the Recommended Plan. Specific recommendations are as follows:

1. Design the new DCC turning basin to avoid 0.89 acre of mature mangroves adjacent to the historic spoil area;
2. Avoid impacts to the mature mangroves currently in a conservation easement west of the TN. This would result in the reduction of 8.48 acres of mature mangrove forest impacts. If the mangroves can not be avoided, we recommend a mitigation ratio of 3:1;
3. Avoid the SAC expansion by both minimizing the dredging and using a bulkhead-riprap system planned for the south side of the DCC;
4. Consider reducing the extent of dredging at the Widener Shoal area at the junction of the IEC and the AIW, and the area south of the nearby boat basin. These shallow sandy areas either presently support, or could support seagrasses including *Halophila johnsonii*;
5. Consider maintaining the present 500 foot channel width for the proposed entrance channel extension, in lieu of the proposed widening to 800 feet to avoid impacts to coral reef habitat;
6. Relocate existing hard coral species one foot in diameter or greater that are capable of relocation, within the footprint of dredging, to appropriate nearby hardbottom substrate prior to dredging or blasting in the entrance channel. Or at a minimum, allow researchers or other appropriate entities to harvest the coral to avoid direct impacts;

7. Continue to seek alternative hardbottom and coral reef mitigation options through the multi-disciplinary Port Everglades Reef Group;
8. Develop a water quality monitoring plan with contingency elements. In addition to turbidity and sedimentation measurements, chemical parameter selection should be determined by additional contaminant sampling and analysis. Apply any new information learned to reduced turbidity and sedimentation during construction of projects, such as the Broward County Beach Protection Project and the Key West Harbor Expansion Project;
9. Design dredging to limit the amount of fine sediment suspension, to minimize sedimentation of hardbottom or seagrasses, and to minimize contaminant dispersal;
10. Provide the Service with final details for disposal methods, *e.g.*, waterway transport methods, pipeline corridors, diking, filtering and decanting specifics, turbidity/contaminant containment devices at the outfall, and a habitat characterization of the disposal sites. Utilize existing corridors and right-of-ways to the maximum extent practicable;
11. Implement Best Management Practices to prevent excessive siltation during hopper barge loading. Proper maintenance of dredging equipment, use of silt curtains or gunderbooms, performing operations when protected species are not present, and dredging only when environmental conditions will not contribute to siltation/sediment transport will minimize the impacts to fish and wildlife resources. We recommend that certain protocols be followed, depending on the method used for dredging. If a hopper dredge is used, operators should eliminate or reduce hopper overflow, lower hopper fill-level, and use a recirculation system. If a mechanical dredge is used, operators should increase cycle time and eliminate both multiple bites and bottom stockpiling. For operations where a hydraulic dredge is used, cutterhead rotation speed and swing speed should be reduced, and bank undercutting should be eliminated. When applicable, special equipment, such as pneuma pumps, closed buckets, large capacity dredges, and precision dredging tools and technologies are recommended to further decrease the potential for adverse effects to marine communities (Corps 2001);
12. The use of blasting to break apart substrates in offshore areas is discouraged. Effects of blasting on managed/protected reef and pelagic species may occur. Non-target reef structures may be damaged, and there could be direct mortality of individuals up to 140 feet away from each charge (Keevin and Hempen 1997). Biological monitoring would help appraise damages to local fish and invertebrate populations and allow for contingency and mitigative measures to be deployed to decrease impacts. The NMFS should be contacted for consultation on effects to free-swimming sea turtles;
13. In order to understand what monitoring criteria, special dredging, and disposal methodologies are required, the Corps should expand sediment sampling for contaminants. Sampling should include representative berthing cuts or "fallout zones," the TN, Southport Channel, and especially the DCC. Lab analyses should be performed similar to the analyses in the Port Everglades and Palm Beach Harbor 1998 Evaluation of Dredged Material for Ocean Disposal report contract number DACW17-97-D-0001, but incorporating detection limits consistent

with SQAG screening criteria and Florida Ambient Water Quality Criteria. This should include a representative bioassay(s) from the DCC;

14. Water quality and sedimentation monitoring plans should be designed with Service input. Sedimentation monitoring would target reef habitat adjacent to offshore dredging and seagrass beds near interior Port dredging. These plans should be implemented during project construction. Monitoring should also include contingency plans, identifying triggers for suspending operations;
15. In addition to the previously discussed protocols for manatee protection, the Service encourages biological monitoring and documentation in order to assess damage to populations of managed and protected fish species;
16. A monitoring plan to measure hardbottom habitat recovery, including channel walls, should be implemented. Monitoring parameters and methods should correspond with those of artificial reef monitoring;
17. Monitoring of all mitigation sites, such as seagrass bed restoration, mangrove wetland restoration, and creation of artificial reefs, should be performed as per mitigation plans;
18. In addition to the above, the Service recommends that EWRAP be used as an additional tool to gauge mangrove restoration success. Baseline scores are available from the Service;
19. Nine acres of spoil are proposed to be removed from West Lake Park spoil islands and prepared for mangrove establishment. If mature mangrove acreages associated with the TN and DCC turning basin are not included in impact summation, and the recommended minimizations for the John U. Lloyd SRA shoreline are followed, mitigation for the remaining (less than) 3.49 acres of mangroves impacted would be adequate. Seedlings should be planted following earthwork. It is also recommended that the existing riprap breakwater bordering the TN mangroves, be breached or culverted in several locations, to provide for improved flushing, detrital export, and fish/invertebrate passage and utilization;
20. The Service believes that the proposed 8.1 acres of mitigation for the direct loss of 5.0 acres seagrass is insufficient to compensate for the temporal loss of function and value of the habitat. We recommend avoiding direct loss and compensating unavoidable losses at a ratio of 3:1;
21. Develop a cable and anchoring plan for construction vessels to avoid anchor cable swing damage to coral and hardbottom reefs associated with dredging and blasting. Post-anchoring damage assessments should be performed, and any impacts from anchoring and cable movement should be quantified and compensated for in the same manner as direct dredging impacts;
22. Conduct a Habitat Equivalency Analysis to determine the appropriate mitigation ratio for the temporal loss of function and value of hardbottom reef and coral reef habitat;

23. Create a 51-acre mitigation reef to compensate for direct impacts to high and low relief hardbottom reef habitat;
24. A plan should be submitted to the Service for annual monitoring of hardbottom reef and channel wall biological recovery.

In addition, the Service recommends inclusion of the following items in the project design to further minimize and reduce potential adverse effects of blasting on listed species. These are excerpted from the FWC's Endangered Species Conservation Conditions for Blasting Activities dated June 2001.

1. The FWC and Service must review a blasting proposal prior to any blasting activities. The blasting proposal must include information concerning a watch program and details of the blasting events. This information must be submitted in writing at least 30 days prior to the proposed date of the blast(s) to the FWC, OES-BPS, 620 South Meridian Street, Tallahassee, Florida 32399-1600 and to the Service's South Florida Ecological Services Office, 1339 20th Street, Vero Beach, Florida 32960. At a minimum, the proposal should include the following information:
 - A list of observers, qualifications, and positions for the watch, including a map depicting the proposed locations for the boat or land-based observers;
 - The amount of explosive charge proposed, the explosive charge's equivalency in TNT, how it will be executed (depth of drilling, in-water, etc.), a drawing depicting the placement of the charges, size of the safety radius and how it will be marked (also depicted on a map), tide tables for the blasting event(s), and time tables (days and times) for blasting event(s);
2. A formal watch coordination meeting at least 2 days prior to the first blast event. Attendants should include the designated observers, construction contractors, demolition subcontractors, and other interested parties such as the Service, FWC, and NMFS. All participants will be informed about the possible presence of manatees, dolphins, marine turtles or whales in nearshore areas and that civil or criminal penalties can result from harassment, injury, and/or death of a listed species;
3. The watch program should begin at least 1 hour prior to the scheduled start of blasting to identify the possible presence of manatees, dolphins, marine turtles or whales, if applicable. The watch program shall continue until at least one half-hour after detonations are complete;
4. The watch program shall consist of a minimum of six observers. Each observer shall be equipped with a two-way radio that shall be dedicated exclusively to the watch program. Extra radios should be available in case of failures. All of the observers shall be in close communication with the blasting subcontractor in order to halt the blast event if the need

arises. If all observers do not have working radios and cannot contact the primary observer and the blasting subcontractor during the pre-blast watch, the blast shall be postponed until all observers are in radio contact. Observers will be equipped with polarized sunglasses, binoculars, a red flag for backup visual communication, and a sighting log with a map to record sightings. All blasting events will be weather dependent. Climatic conditions must be suitable for optimal viewing conditions, determined by the observers;

5. The watch program shall include a continuous aerial survey to be conducted by aircraft, upon Federal Aviation Administration approval, or use other suitable means of reconnaissance, to determine the presence of marine mammals and reptiles. The event shall be halted if an animal(s) is spotted within 300 feet of the perimeter of the safety zone or the danger zone as defined by the Corps in their project description. An "all-clear" signal must be obtained from the aerial observer before detonation can occur. The blasting event shall be halted immediately upon request of any of the observers. If animals are sighted, the blast event shall not take place until the animal(s) move out of the area under their own volition. Animals shall not be herded away or harassed into leaving. Specifically, the animal must not be intentionally approached by project watercraft. If the animal(s) is not sighted a second time, the event may resume 30 minutes after the last sighting;
6. The observers and contractors shall evaluate any problems encountered during blasting events and logistical solutions shall be presented to the Service and the FWC. Corrections to the watch shall be made prior to the next blasting event. If any one of the aforementioned conditions is not met prior to or during the blasting, the watch observers shall have the authority to terminate the blasting event until resolution can be reached with the Service and FWC;
7. If an injured or dead marine mammal or turtle is sighted after the blast event, the watch observers shall contact the Service at 772-562-3909 and the FWC through the Manatee Hotline at 1-888-404-FWCC and 850-922-4330. The observers shall maintain contact with the injured or dead marine mammal or sea turtle until authorities arrive. Blasting shall be postponed until the Service and FWC can determine the cause of injury or mortality. If blasting injuries are documented, all demolition activities shall cease. A revised plan shall then be submitted to the Service and FWC for approval; and
8. Within 14 days after completion of all blasting events, the primary observer shall submit a report to the Service and FWC providing a description of the event, number and location of animals seen and what actions were taken when the animals were seen. Any problems associated with the events and suggestions for improvements shall also be documented in the report.

9.0 SUMMARY OF SERVICE'S POSITION

In conclusion, implementation of the Recommended Plan may impact fish and wildlife resources directly and indirectly as a result of dredging and/or blasting activities. The fish and wildlife resources likely to be directly and indirectly affected include seagrass, low relief hardbottom,

high relief coral reefs, rock/rubble habitat, and shallow sandy bottom habitat. The Corps has proposed to avoid and minimize potential adverse effects through the redesign or exclusion of certain project elements and the implementation of listed species protection plans during construction activities.

The Service has provided several recommendations in this document to further minimize or avoid possible adverse effects of the harbor expansion project on fish and wildlife resources. Specifically, the Service recommends the following to better compensate for the temporal loss of function and value of the impacted habitats by: (1) significantly increasing the mitigation ratio (*e.g.*, to 3:1) for mangroves if the 8.48 acres in the conservation easement can not be avoided; (2) increasing the mitigation ratio for impacted seagrass habitat from 1:1 to 3:1 for a total of 15 acres; (3) developing a Seagrass Monitoring Plan that contains success criteria that are consistent with Fonseca et al. (1998); (4) creating a 51-acre mitigation reef to compensate for direct impacts to high and low relief hardbottom reef habitat; (5) providing adequate mitigation for the temporal loss of function and value associated with the low relief hardbottom habitat located within the previously dredged channels, particularly the channel walls; and (6) continuing to seek alternative methods to mitigate for reef impacts through the Port Everglades Reef Group. In addition, the Service recommends the development of a comprehensive (pre, during, and post project) environmental monitoring program to verify that project impacts occurred within the levels anticipated and to ensure that the mitigation areas are performing to a level where habitat replacement values are maintained.

We encourage the Corps to continue to work with the Port Everglades Reef Group to develop alternative mitigation for coral reef impacts and to use "lessons learned" from other projects and look forward to our ongoing cooperation in determining suitable impact minimization actions. We appreciate the Corps' commitment to maintaining open lines of communication and the mutual exchange of ideas and recommendations through the planning process of this controversial project.

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Table 1. Previous Port modification projects.

Year	Project	Agency Permit Number	Impact	Mitigation
1983	Berth 29 Bulkhead and SAC from "Knuckle" (bend) to FPL canal	USACE 81L-0624 FDER 060419139	Unvegetated bottom, 311,000 cubic yards (cy) of material	Creation of 0.4 acre mangroves ¹
1984	Pier 7 Channel Dredging between MTB and SAC	USACE 83D-2441 FDER 060257779	Unvegetated bottom, 242,222 cy of material	None
1984	East SAC dredging from FPL canal to adjacent to Berth 32	USACE 84D-0385 FDER 060748269	Dredge 46 acres unvegetated bottom, fill 4.73 acres of unvegetated bottom	None
1987	Construct TN	USACE 84R-4146 FDER 060924019	18.27 acres of mangrove wetlands	Creation of 45 acres of mangroves ² , preservation of 48 acres of mangroves ³ , designation of manatee refuge ⁴
1989	Construct Berth 33	USACE 84Y-4246 FDER 061407349	2.0 acres of mangrove wetlands	Creation of 4.5 acres of mangroves ⁵

¹Located across SAC from Berth 26.

²Located along east shore of SAC north of John U. Lloyd boat launch, south to across from Berth 32.

³Wetlands located north and west of TN.

⁴Located in West Lake Park: Area 1, along property just north of Dania Beach Boulevard, approximately 500 feet west of AIW, and Area 2, approximately 500 feet west of Intracoastal Waterway, south of Sheridan Street.

Table 2. Relative abundance of fish species observed during visual surveys conducted in May 2001 at nearshore hardbottom and offshore reef sites along transects within the entrance channel and adjacent areas (adapted from DC&A 2001). A = abundant, C = common, O = occasional, R = rare.

Common Name	Scientific Name	Channel	Hard Bottom	Offshore Reef
Bar jack	<i>Caranx ruber</i>	O	-	O
Beaugregory	<i>Pomacentrus partitus</i>	A	-	A
Bermuda chub	<i>Kyphosus sectatrix</i>	O	-	-
Blenny	<i>Malacoctenus spp.</i>	-	O	O
Blue tang	<i>Acanthurus coeruleus</i>	C	C	C
Bluehead wrasse	<i>Thalassoma bifasciatum</i>	A	C	C
Bluestriped grunt	<i>Haemulon sciurus</i>	-	-	O
Checkered puffer	<i>Sphoeroides tetradineus</i>	R	-	-
Cocoa damselfish	<i>Pomacentrus variabilis</i>	A	C	A
Dusky damselfish	<i>Pomacentrus fuscus</i>	C	-	C
Foureye butterflyfish	<i>Chaetodon capistratus</i>	-	-	O
French angelfish	<i>Pomacanthus paru</i>	O	-	O
French grunt	<i>Haemulon flavolineatum</i>	-	-	O
Gray triggerfish	<i>Balistes capriscaus</i>	-	-	O
Green moray	<i>Gymnothorax funebris</i>	R	-	-
Grey angelfish	<i>Pomacanthus arcuatus</i>	O	-	O
Hairy blenny	<i>Labrisomus nuchipinnis</i>	R	-	-
Hamlet	<i>Hypoplectrus unicolor</i>	-	-	O
Harlequin bass	<i>Serranus tigrinus</i>	-	-	O
Highhat	<i>Equetus acuminatus</i>	R	-	-
Hogfish	<i>Lachnolaimus maximus</i>	-	-	O
Juvenile grunts	<i>Haemulon spp</i>	A	-	-
Juvenile snapper	<i>Lutjanus spp</i>	A	-	-
Ocean surgeon	<i>Acanthurus bahianus</i>	C	C	C
Porkfish	<i>Anisotremus virginicus</i>	-	-	O
Princess parrotfish	<i>Scarus guacamaia</i>	O	C	O
Purplemouth moray	<i>Gymnothorax vicinus</i>	-	-	R
Queen angelfish	<i>Holocanthus ciliaris</i>	O	-	O
Red grouper	<i>Epinephelus morio</i>	-	-	O
Reef butterflyfish	<i>Chaetodon sedentarius</i>	-	-	O
Rock beauty	<i>Holocanthus tricolor</i>	-	-	O
Scrawled cowfish	<i>Lactophyrus quadricomis</i>	-	-	O
Sergeant major	<i>Abudefduf saxatilis</i>	A	C	-
Sharpnose puffer	<i>Canthigaster rostrata</i>	R	-	R
Sheepshead	<i>Archosargus probatocephalus</i>	R	-	-
Slippery dick	<i>Halichoeres bivittatus</i>	A	C	C
Spanish mackerel	<i>Scomberomorus maculatus</i>	-	-	O
Spotfin butterflyfish	<i>Chaetodon ocellatus</i>	-	-	O
Spottail pinfish	<i>Diplodus holbrooki</i>	C	-	-
Spotted goatfish	<i>Pseudopeneus maculatus</i>	-	-	O
Stoplight parrotfish	<i>Sparisoma viride</i>	O	C	O
Tobaccofish	<i>Serranus tabacarius</i>	-	-	O
Yellow stingray	<i>Urolophus jamaicensis</i>	-	-	O
Yellowhead jawfish	<i>Opistognathus aurifrons</i>	-	-	R
Yellowhead wrasse	<i>Halichoeres garnoti</i>	-	-	C
Yellowtail snapper	<i>Ocyurus chrysurus</i>	-	O	O

Table 3. Number of nests for three species of sea turtles at John U. Lloyd SRA during 6 years (adapted from Burney and Margolis 1999).

	1994	1995	1996	1997	1998	1999
Loggerhead	190	248	206	181	253	210
Green	14	10	18	5	21	2
Leatherback	1	0	0	2	3	0

Table 4. Project alternatives and recommended plan.

Alternative Number	Combined Elements	General Description
1	S-1A S-5A S-8 S-9	Deepen and widen OEC, SAC, TN, DCC, Widener. Deepen IEC, MTB, and STB. Bulkhead along John U. Lloyd SRA and West Lake Park.
2	S-1A S-5B S-8 S-9	Deepen and widen OEC, SAC, TN, DCC, Widener. Deepen IEC, MTB, and STB. Bulkhead along John U. Lloyd SRA. Side slope along West Lake Park.
3	S-1B S-5A S-8 S-9	Deepen and widen OEC, SAC, TN, DCC, and Widener. Deepen IEC, MTB, and STB. Side slope along John U. Lloyd SRA. Bulkhead along West Lake Park
3A	S-1B (modified) S-5A (modified) S-8 S-9 Extend OEC	Same as Alt 3 except greater impacts to USCG facility, reduced impacts to John U. Lloyd SRA. Impacts to NSU. Greater impacts to West Lake Park. Greater extent in DCC. Includes extension of OEC an additional 2,200 feet.
4	S-1B S-5B S-8 S-9	Deepen and widen OEC, SAC, TN, DCC, and Widener. Deepen IEC, MTB, and STB. Side slope along John U. Lloyd SRA and West Lake Park
5	NA	No-Action Alternative. Port would continue operations under existing parameters.
6 (NED Plan)	S-1A (revised) S-5A (revised) S-8 (revised) S-9 (revised)	Deepen and widen OEC, SAC, TN, DCC, Widener. Deepen IEC, MTB, and STB. Bulkhead along John U. Lloyd SRA and West Lake Park. Includes extension of OEC an additional 2,200 feet. Spoil disposal to upland site 1 and ODMDS.
7 (Recommended Plan)	S-1A (revised) S-5A (revised) S-8 (revised) S-9 (revised)	Deepen and widen OEC, SAC, TN, DCC, Widener. Deepen IEC, MTB, and STB. Bulkhead along John U. Lloyd SRA and West Lake Park. Includes extension of OEC an additional 2,200 feet. Spoil disposal to upland sites 1 and 2.

Table 5. Habitat restoration and enhancement elements at West Lake Park.

Element	Area Footprint (acres)	Area Benefit (acres)
Mangrove restoration from spoil island	9.00	18.00
Mangrove protection	4.70	185.00
Shallow water tidal flat creation	9.20	18.00
Channel/circulation Improvements	11.40*	23.00*
Seagrass enhancement by removal of barges	3.00	3.00
Hydrologic/circulation/water quality improvement.	n/a*	95.00*
Manatee protection barriers	n/a	58.00
Maintenance dredging- remove silt - improve water quality	25.00*	100.00*
Wetland planting to stabilize eroding soils	18.00	56.00
Enhance and protect bird rookeries	0.50	2.00
Establish osprey towers	5 towers	12.00
Outparcel acquisition/conservation easement	100.00	100.00

*Circulation/flushing/dredging improvements estimated to restore 40 to 60 acres of SAV in West Lake embayment.

Table 6. Recommended Plan impact (acres) by mangrove habitat type.

	S-1B (mod)	S-5A (mod)	S-8	S-9	Berths	Total
Mixed species habitat	0.64	0.00	0.00	0.00	0.00	0.64
Mature red mangroves at AIW	0.68	0.00	0.00	0.00	0.00	0.68
Created mangroves	0.64	0.00	0.00	0.00	0.00	0.64
Mangrove habitat bordered by riprap	0.41	0.00	0.00	8.48	0.00	8.89
Stunted mangroves	0.00	1.05	0.00	0.00	0.00	1.05
Mature red mangroves at Dania Canal	0.00	0.84	0.00	0.00	0.00	0.84
Scattered/mixed mangroves on Dania north shore	0.00	0.50	0.00	0.00	0.00	0.50
Total	2.37	2.39	0.00	8.48	0.00	13.24

Table 7. Annual number of manatee deaths in Broward County as a result of various causes during a 28 year period.

	Watercraft	Flood Gate/ Canal Lock	Other Human	Perinatal	Cold Stress	Natural	Undetermined	Unrecovered	Total
1974	0	0	0	0	0	0	1	0	1
1975	1	0	0	0	0	0	0	0	1
1976	1	0	0	0	0	0	0	0	1
1977	0	0	1	1	0	0	2	0	4
1978	0	0	0	1	0	0	0	1	2
1979	0	0	0	0	0	0	2	0	2
1980	2	1	0	2	0	0	1	4	10
1981	1	0	0	0	0	0	1	0	2
1982	2	1	0	0	0	0	1	0	4
1983	1	0	0	0	0	1	0	0	2
1984	2	0	0	0	0	0	3	0	5
1985	0	1	2	0	0	0	1	0	4
1986	2	0	0	2	1	0	0	1	6
1987	5	0	0	0	0	0	1	0	6
1988	2	0	1	0	1	1	0	0	5
1989	3	0	0	1	0	0	0	0	4
1990	1	0	0	0	0	0	0	0	1
1991	2	1	0	0	0	0	0	0	3
1992	2	0	0	5	0	0	2	0	9
1993	2	0	0	1	0	0	1	0	4
1994	3	0	0	1	0	0	0	0	4
1995	0	1	0	4	0	0	0	0	5
1996	1	0	0	2	0	1	2	0	6
1997	0	0	0	1	0	0	2	0	3
1998	2	1	0	2	0	0	2	0	7
1999	5	0	0	4	0	1	5	0	15
2000	2	0	0	1	0	0	1	0	4
2001	4	0	0	3	1	0	0	0	8

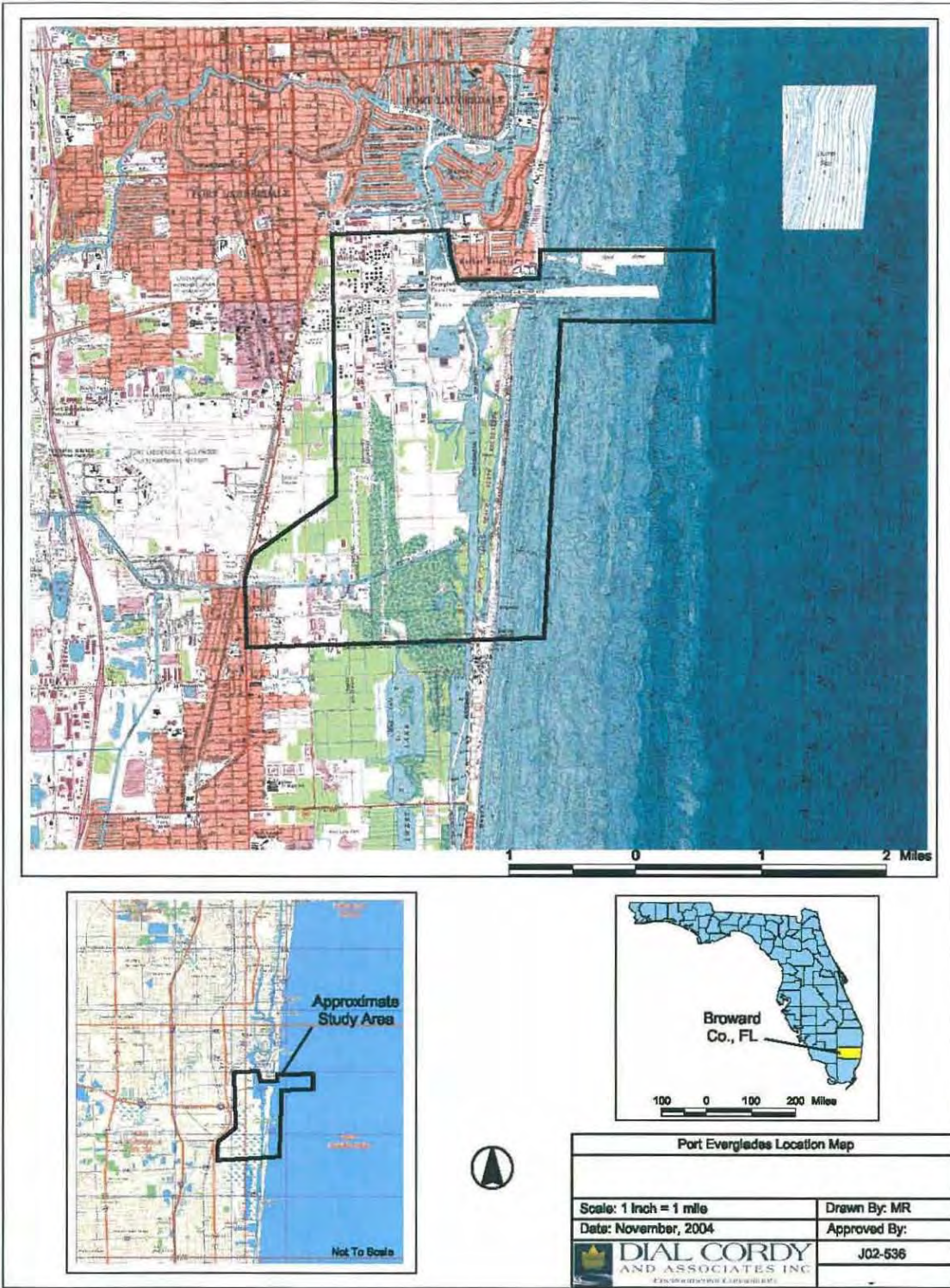


Figure 1. Port Everglades project location.



Figure 2. Mangrove communities in the vicinity of Port Everglades.

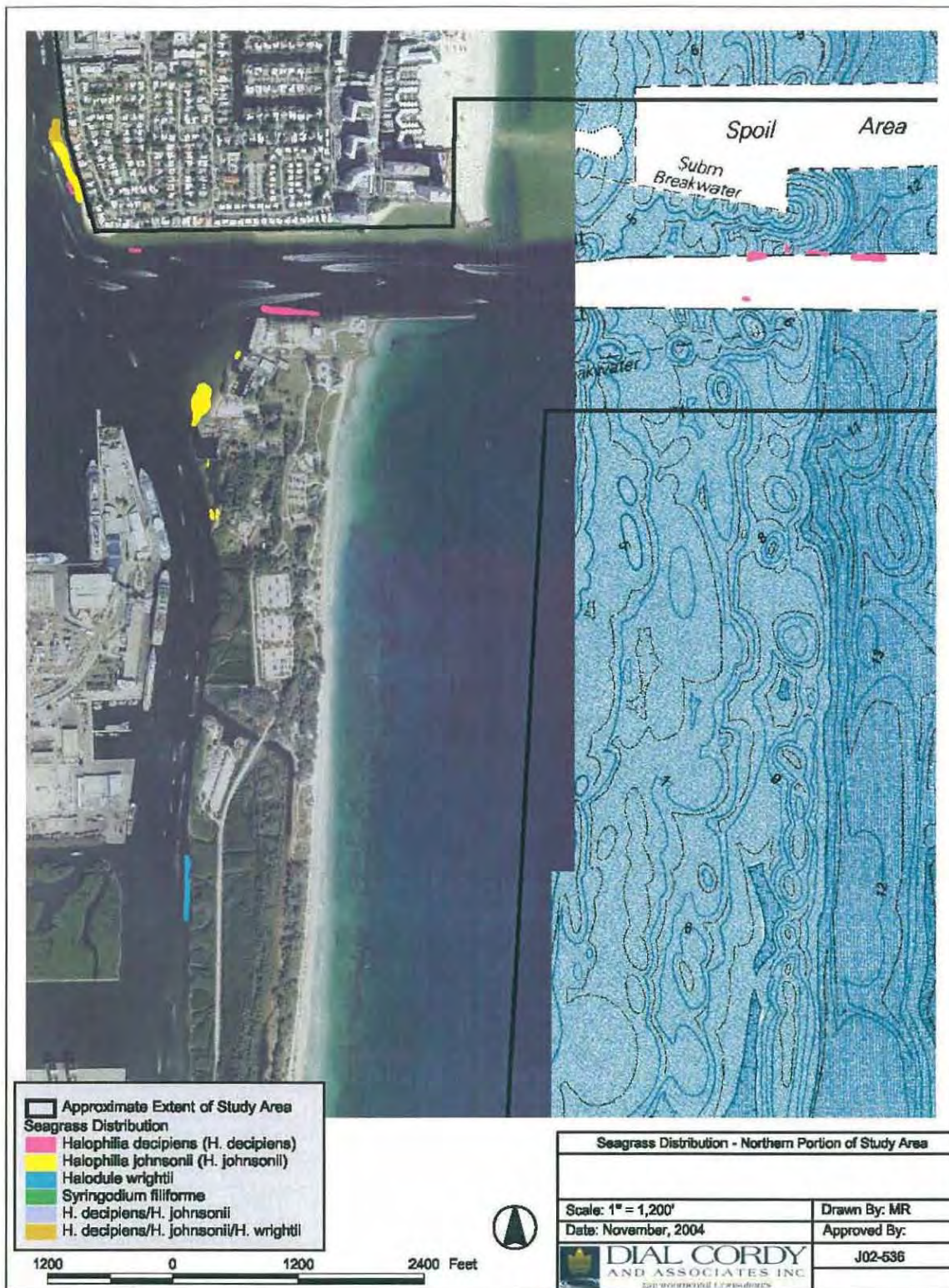


Figure 3. Seagrass distribution in the northern portion of the project area.



Figure 4. Seagrass distribution in the southern portion of the project area.

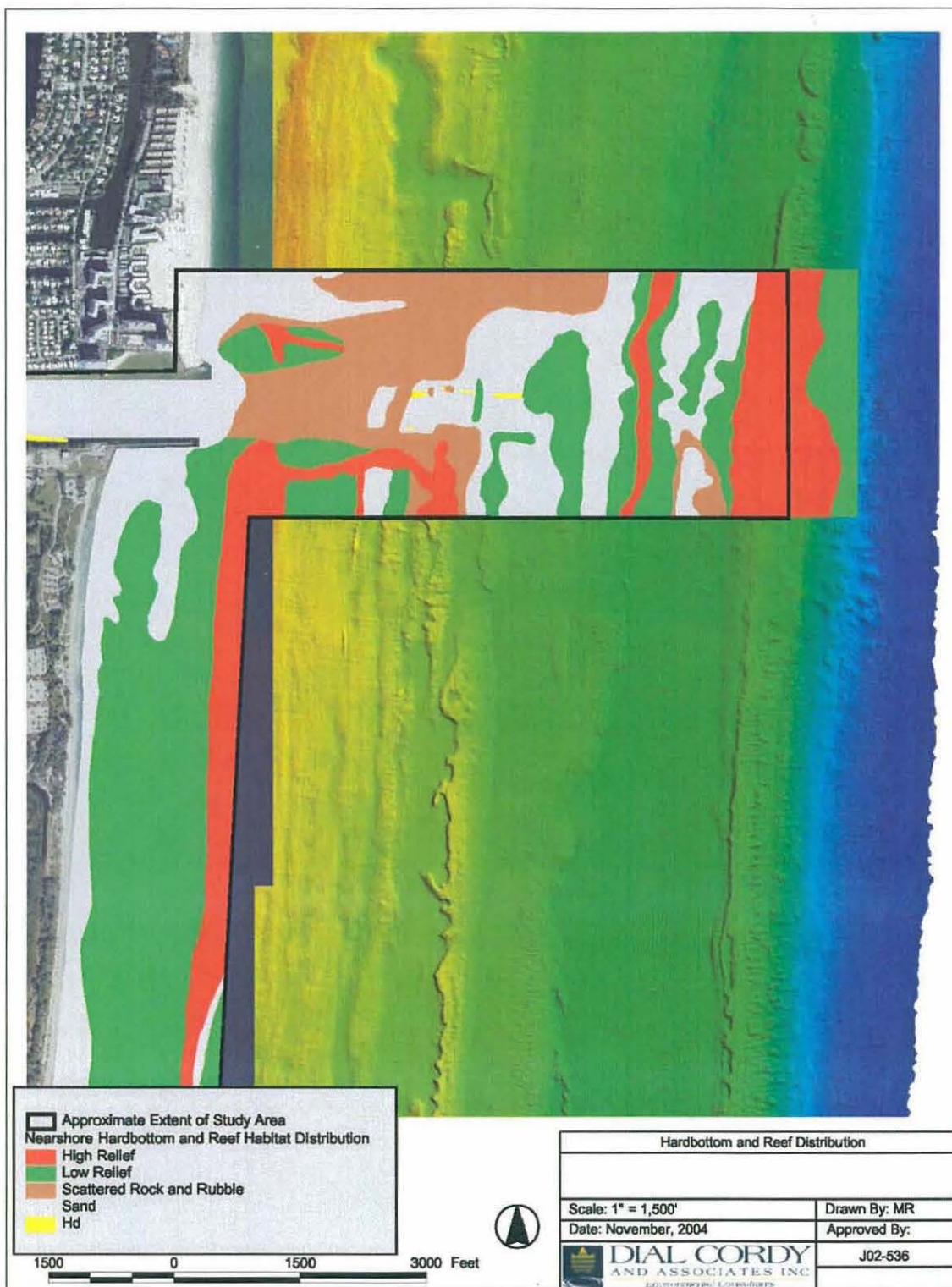


Figure 5. High and low relief hardbottom and coral reef distribution in project area.

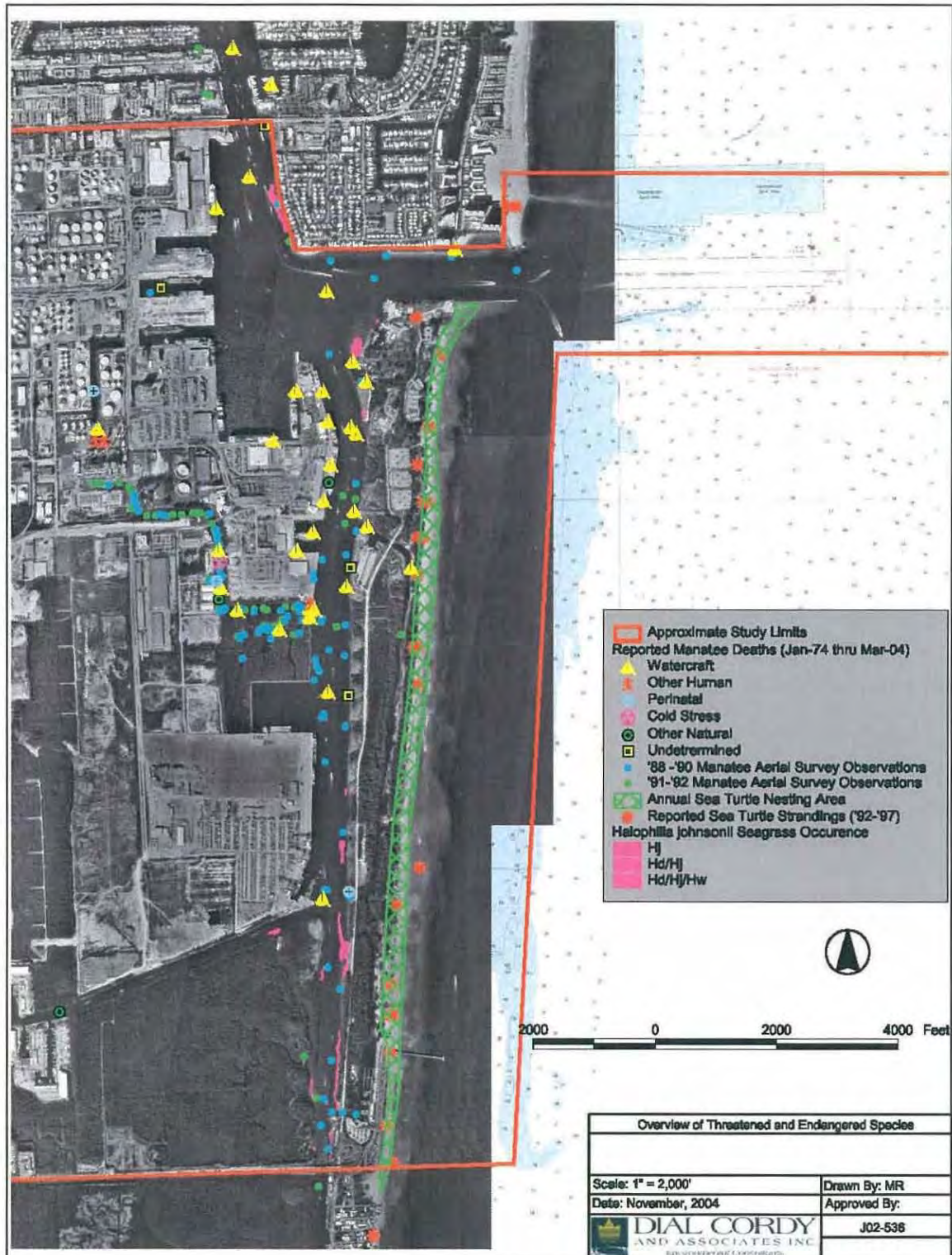


Figure 6. Threatened and endangered species observations and occurrence.

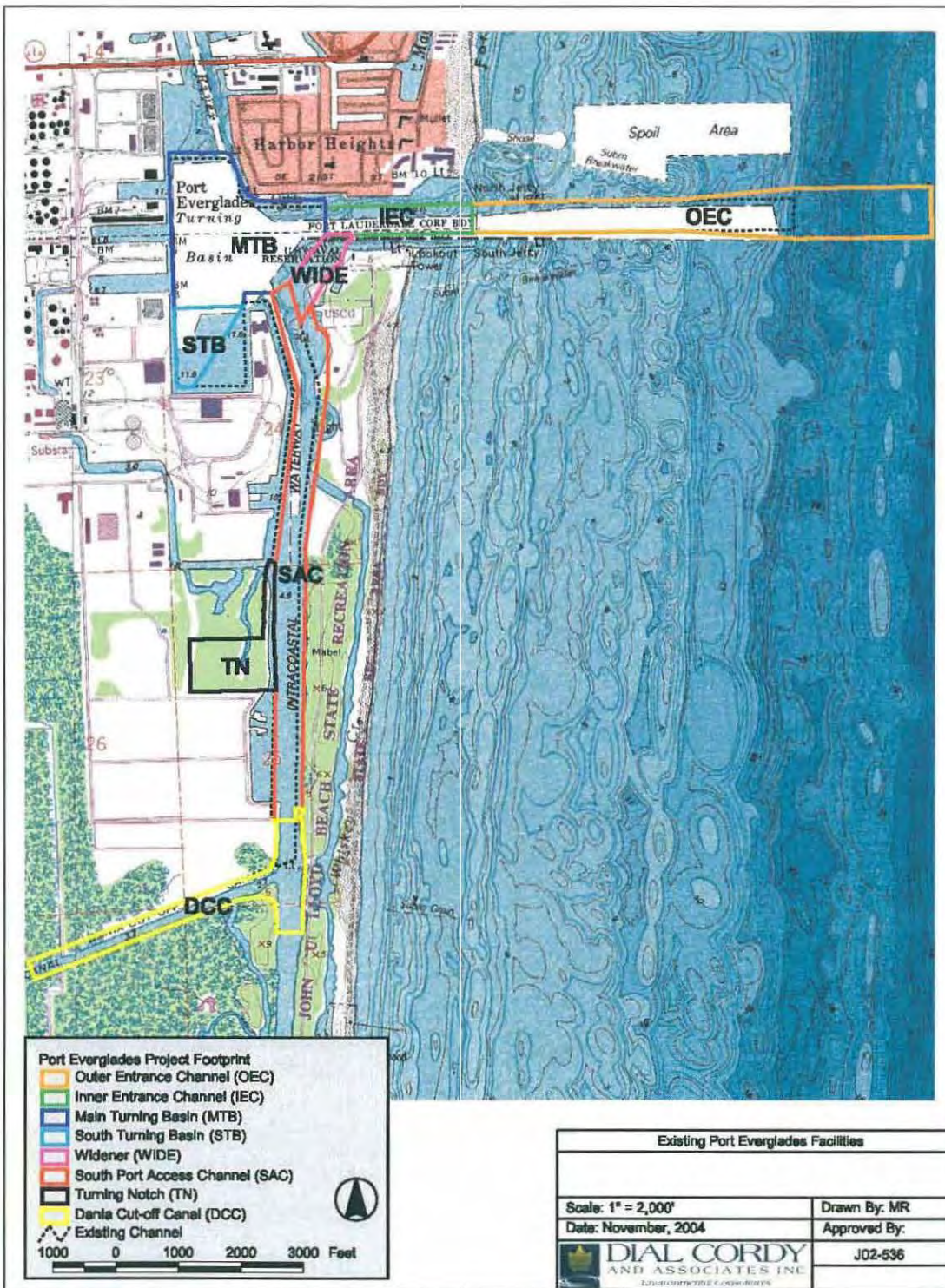


Figure 7. Existing facilities at Port Everglades.

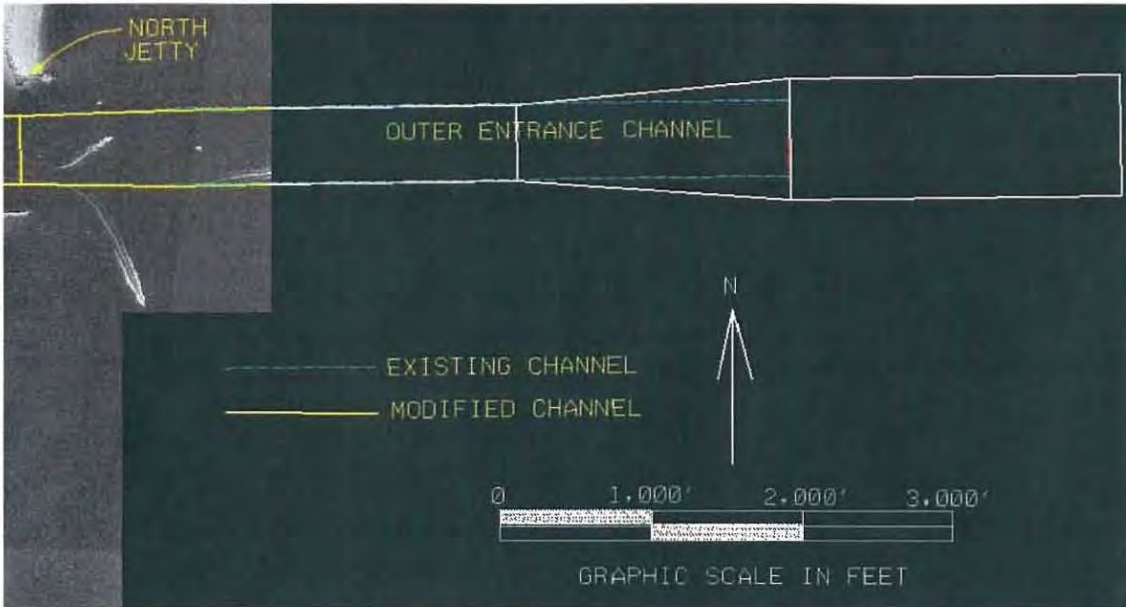


Figure 8. Proposed plan to deepen, widen, and extend the OEC.



Figure 9. Proposed plan to deepen and widen the TN.

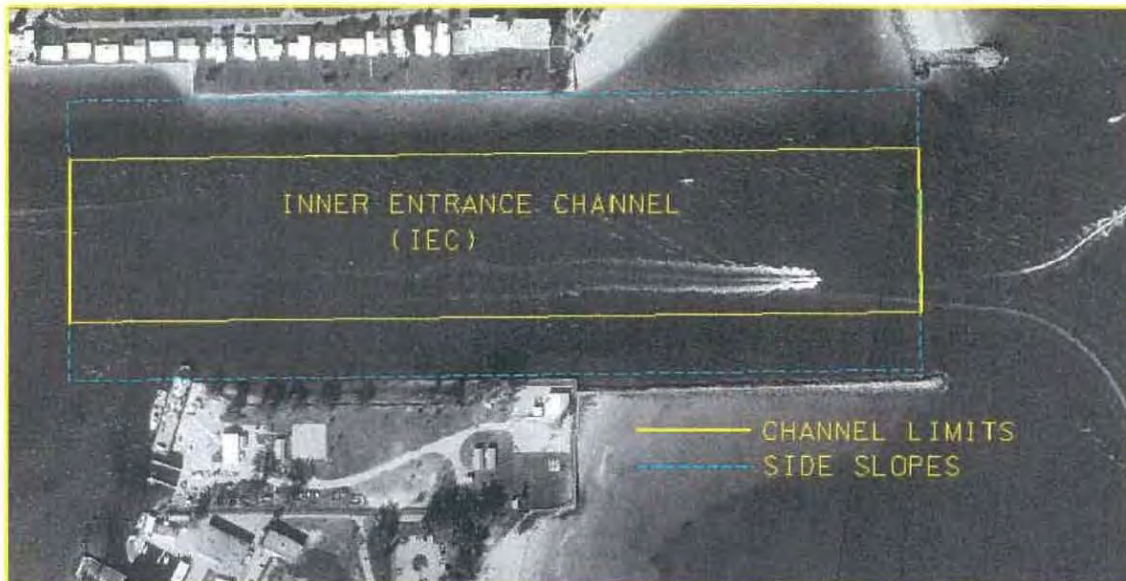


Figure 10. Proposed plan to modify the IEC.



Figure 11. Proposed plan to modify the MTB.



Figure 12. Proposed plan to modify the STB.



Figure 13. Two potential disposal sites for material excavated during the Port project.

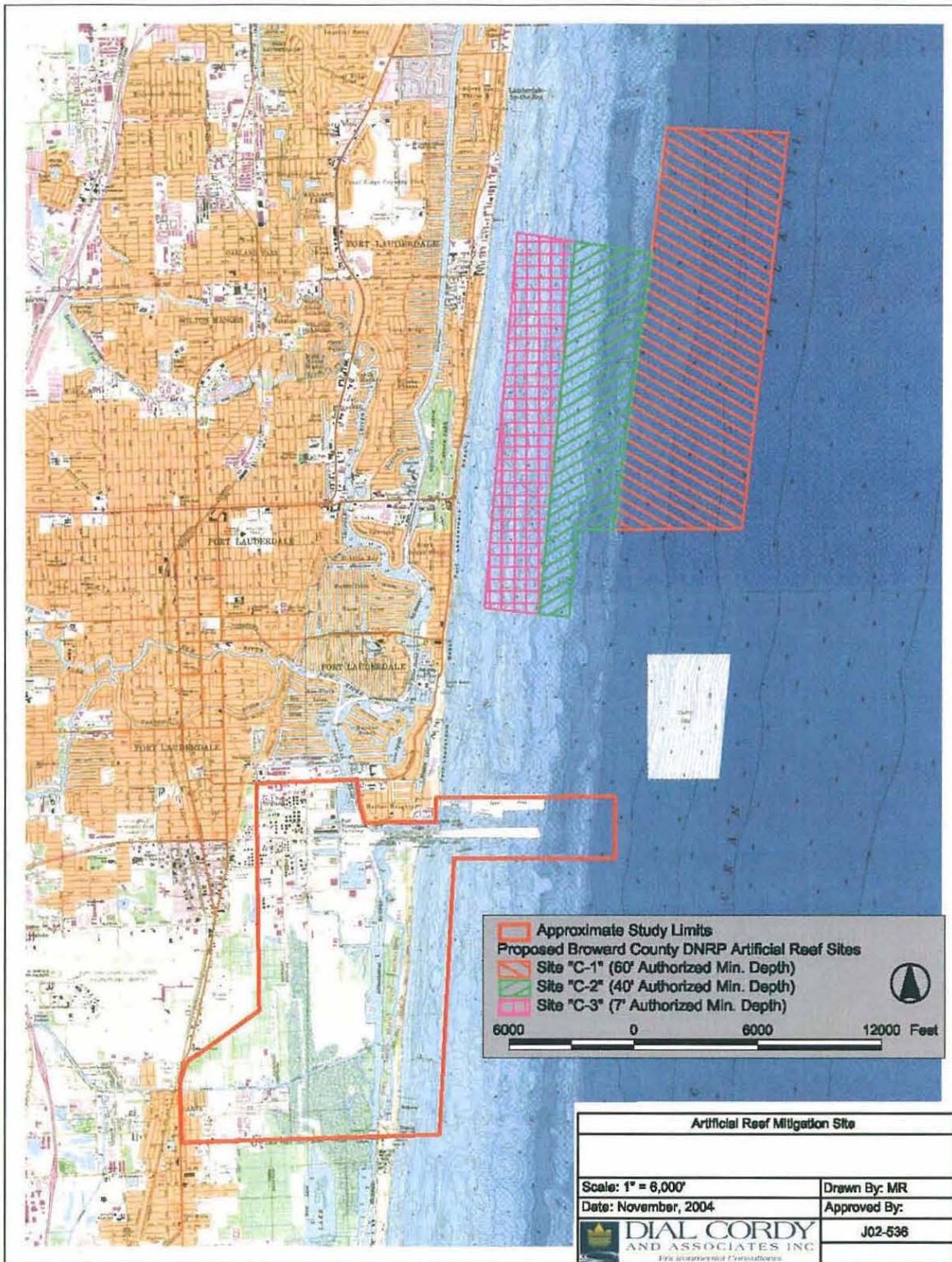


Figure 14. Proposed locations for mitigation reefs.

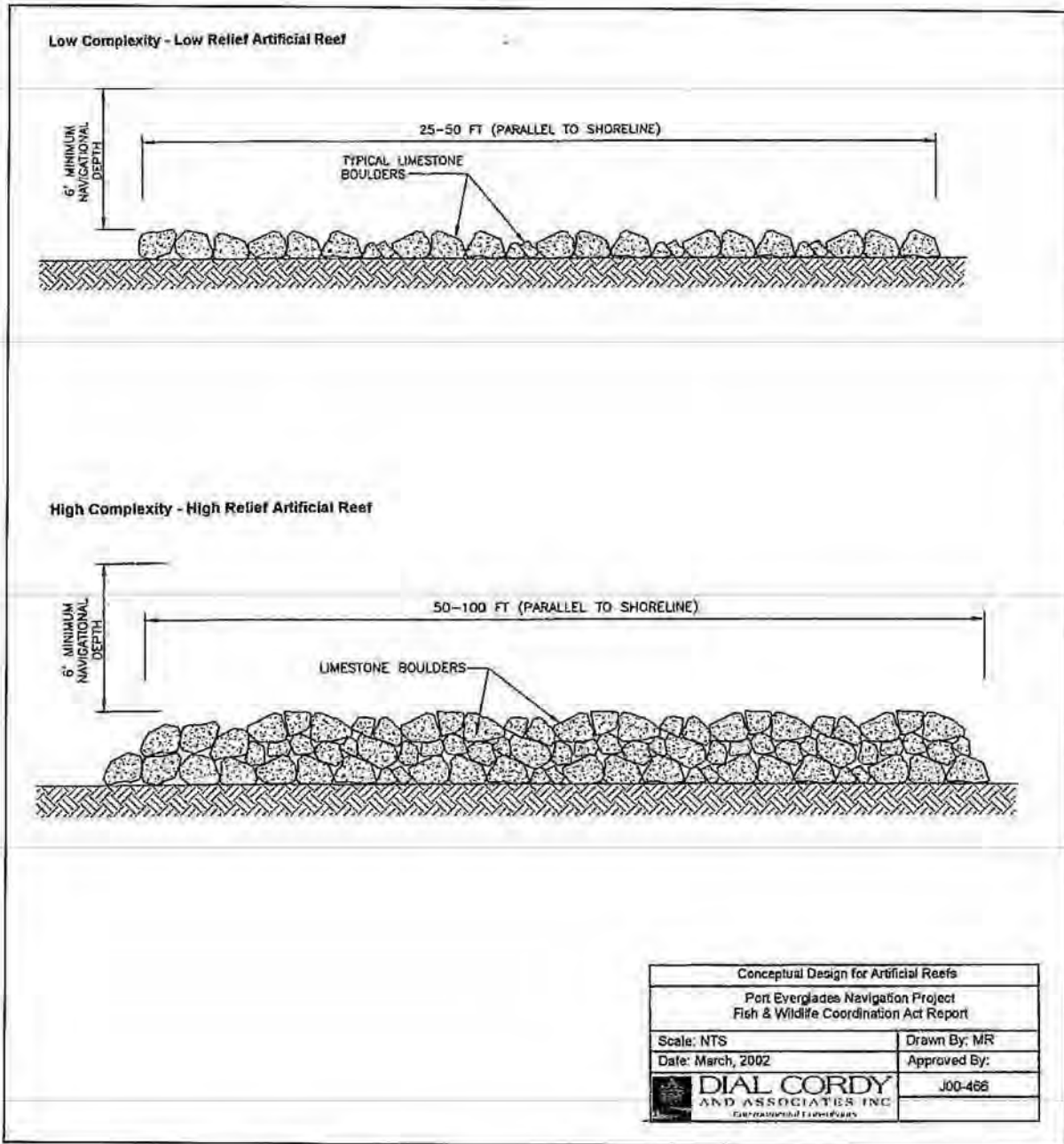


Figure 15. Conceptual design for artificial reef sites.

APPENDIX A

Previous Correspondence from U.S. Fish and Wildlife Service



United States Department of the Interior
FISH AND WILDLIFE SERVICE

3100 University Blvd. South
Suite 120
Jacksonville, Florida 32216

October 28, 1987

Mr. A.J. Salem
Chief, Planning Division
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Mr. Salem:

This represents the Biological Opinion of the U.S. Fish and Wildlife Service in accordance with Section 7 of the Endangered Species Act of 1973, as amended, regarding permit application 84B-4146 (FWS Log No. 4-1-85-026). This opinion satisfies the consultation requirements of Section 7(a)(2) of the Endangered Species Act of 1973, as amended, and does not address the requirements of other environmental statutes such as the National Environmental Policy Act or the Fish and Wildlife Coordination Act. A complete administrative record of this consultations is on file in this office.

PROJECT DESCRIPTION

The applicant, Port Everglades Authority, proposes to construct a turning notch or slip to facilitate use of a container Port being developed northwest of the intersection of the Dania Cut Off Canal and the Atlantic Intracoastal Waterway in Broward County, Florida (Figure 1). The applicant also intends to dredge, deepen, and backfill a portion of the Intracoastal Waterway to construct a bulkhead and return wall along the Intracoastal Waterway and a portion of the Dania Cut Off Canal.

The turning notch will require excavation of approximately 400,000 cubic yards of organic soils and 800,000 cubic yards of limerock to minus 46 feet mean low water to form a basin with a bottom width of 800 feet by 900 feet. The bulkhead will be on the western side of the deepened waterway, and will extend about 900 feet south of a previously permitted bulkhead to the north.

To mitigate the proposed wetland fill, the applicant proposes to improve wetlands in the John U. Lloyd State Park, create new wetlands in the park, create a manatee refuge at the park and provide the State with a perpetual conservation easement to the 52 acres of mangrove wetlands remaining within the applicants property. To allow manatees

1980-81, 110; 1981-82, 57; 1982-83, 56; 1983-84, 28; and 1984-85, 234.

Currently, the majority of Port activity has been north of the discharge canal. On July 10, 1984, the Corps issued the Port a permit to construct a 1900-foot bulkhead (PN 84K-0385) from a point just north of the discharge canal to the north of the Dania Cut Off Canal. This proposed action will increase Port activity to the south with or without the turning notch. The turning notch will be located south of the discharge canal (Figure 1). The annual number of port vessel movements, which is defined as a single trip, averaged 3,584 from 1978 to 1985. The single highest year was 1978 with 4,006 movements; the lowest was 1983 with 3,206. The construction of the turning notch, if approved by the Corps, will enable the Port to expand its capability to handle larger containerized ships. At the present time, about 20 container ships of between 400 to 700 feet in length use the north end of the Port per month (240 per year). When the south end of the Port is completed, many of these ships will relocate to this area. It is estimated that about 300 of these vessels will use the Port, including the new facility, which is an increase of 60 vessels per year. In addition the Port expects about 54 of the newer class container ships, measuring 950 feet in length, to use the new facilities at the south end. With the turning notch in place, a container ship will be escorted by 2 tugs, under its own power. Without the notch, the ship will be under dead tow, with the possibility of one or more additional tugs required.

Since 1974, there has been a cooperative effort between the State and the Service to salvage dead manatees and to determine the cause of death. The distribution of manatee mortality is disproportionate between the east and west coasts of Florida, the east coast having a significantly higher incidence of overall mortality. One category of manatee mortality is from boat/barge collisions, of which 69 percent occurred on the east coast and 31 percent on the west coast. The statewide average for boat/barge mortality is 23 percent. Broward County has recorded a total of 46 dead manatees since 1974, of which 16 have died as a result of boat/barge collisions.

In the Port Everglades zone, defined to be from the Dania Cut Off Canal to the 17th Street Bridge, there have been eight manatee fatalities attributed to boat collisions from 1974 through April 1987 (Figure 1). One fatality (M8308) is not shown on the map as the exact recovery coordinates are not available. Five of the eight animals were determined to be crushed with no indication in the report of propeller wounds. The remaining three animals were crushed but with propeller wounds as well. All eight deaths occurred in January and February when manatees were congregated at the warm water discharge. In 1981 there was one recorded fatality; 1983, 1; 1984, 1; 1986, 1;

this canal, and either float into the Port Everglades area on prevailing currents, or die in the Port.

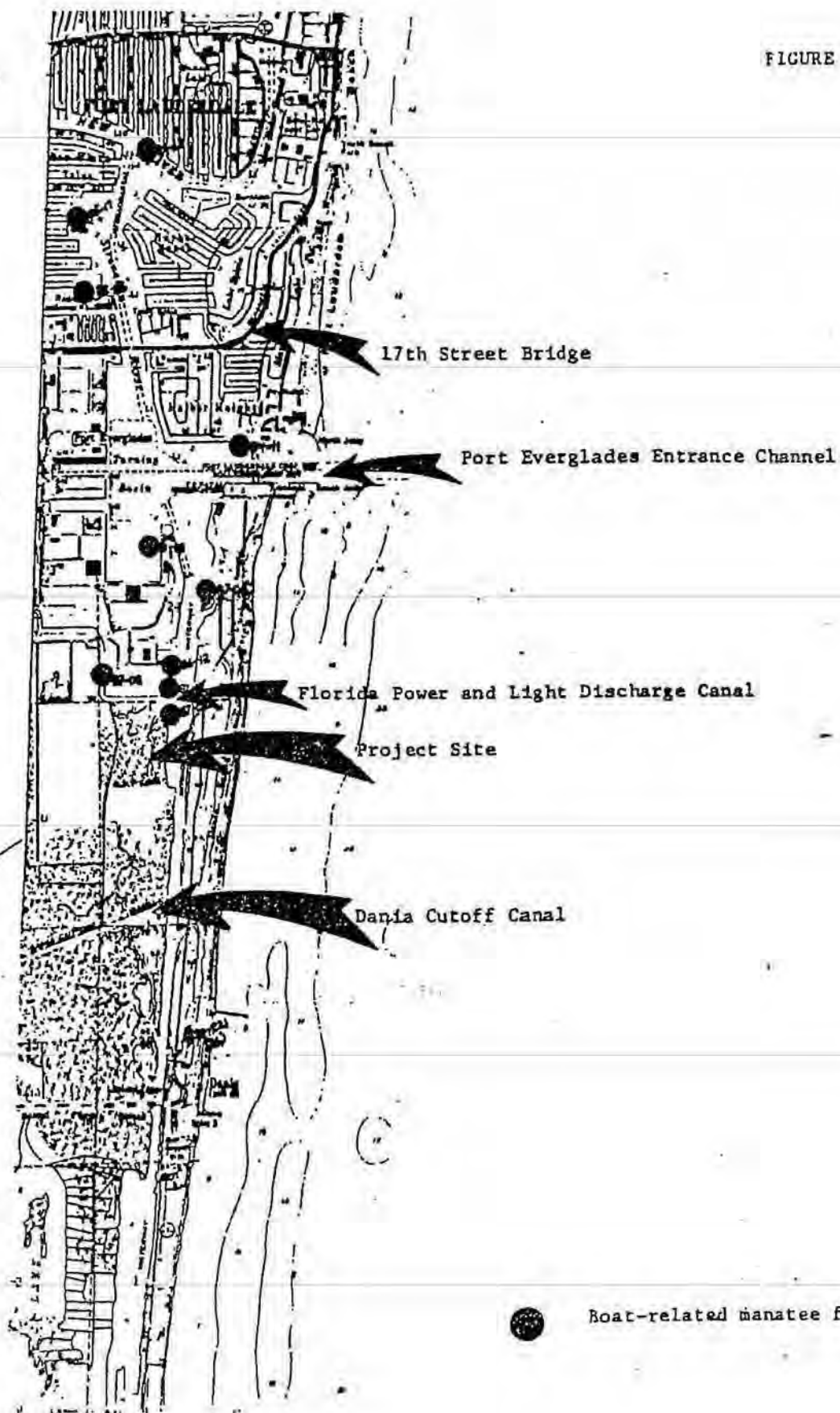
The Service is concerned that the potential for increased Port traffic south of the discharge canal will contribute to an already serious situation that exists in this area. The mortality occurs during the winter period when manatees are congregated at the warm water discharge. Five of the eight boat-related deaths in the Port area resulted from crushing with no apparent propeller cuts. The depth of the Intracoastal Waterway would preclude animals from being crushed between the hull of the vessel and the bottom of the channel; therefore, these animals were killed either by collisions with vessels, or from being caught against bulkheads. Large recreational boats moving slowly or small boats moving fast can inflict an injury on impact that will result in death. The Service does not believe, however, that increasing use of the Intracoastal Waterway south of the discharge canal by one ship per day, will significantly increase the threat to manatees over what currently exists at the present time. The container ships will be moving very slowly in the middle of the channel, partially assisted by tugs throughout the length of travel. As a result of our review of this project and discussions with the Port Authority, it is the Service's Biological Opinion that the construction of the turning notch is not likely to jeopardize the continued existence of the manatee. The standard manatee precautions will be added to the permit, if issued.

CONSERVATION RECOMMENDATIONS

We recommend that the following actions be taken in order to further reduce the likelihood of additional boat-related manatee mortality:

1. The Port should select another site for the turning notch north of the discharge canal to reduce the hazard to manatees. This would require either modifying existing facilities or excavating the notch from uplands.
2. The Port Authority, through an ongoing educational program, should stress to the owners of the tug boats the need to watch for manatees in the channel and turning notch. Manatees will probably use the basin from time to time as a refuge, and with the maneuvering of tugs, there is the possibility of an incident. The operators should be aware of this, and should check the stern of the tug before engaging the propeller or backing.
3. The Florida Department of Natural Resources shall increase its law enforcement capability in the Port Everglades speed zone. This

FIGURE 1

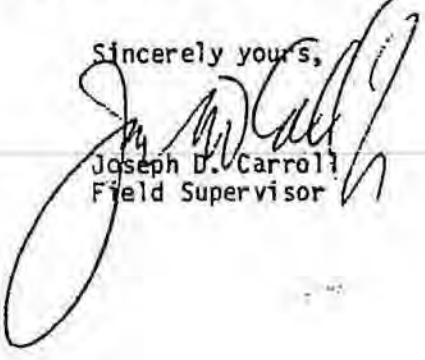


Our Mitigation Policy requires that such losses be avoided if at all possible before compensation is considered. Although we have worked with the applicant from the first stages of project planning, we cannot ascribe to the applicant's view that these mangroves are expendable. In our opinion, the proposed mitigation, although it is equally sized, is inappropriate because the losses can be avoided by relocation of the turning notch to uplands.

We recommend that this permit be denied and the applicant pursue other, less damaging alternatives.

This report represents the views of the Department of the Interior. Please contact this if we may provide further information regarding this permit application.

Sincerely yours,



Joseph D. Carroll
Field Supervisor

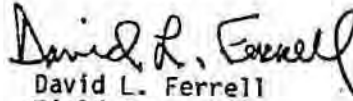
cc:
EPA, Atlanta, GA
NMFS, St. Petersburg, FL
NMFS, Panama City, FL
FG&FWFC, Tallahassee, FL
FG&FWFC, Vero Beach, FL
DER, Tallahassee, FL
AWE, FWS, Atlanta, GA
SE, Jacksonville, FL

Since a project of this magnitude in Port Everglades, a documented manatee concentration area, has the potential to adversely affect the endangered West Indian manatee, we believe that Section 7 consultation regarding maintenance dredging of the Port will be necessary. In addition, if the dredged material is proposed to be disposed on the beach and listed sea turtles would be affected, Section 7 consultation for sea turtles would also be necessary.

In conclusion, the Service recommends that the Jacksonville District prepare a supplemental EIS fully describing the proposed action and that you solicit public input and fulfill your responsibilities under the above-referenced environmental laws and regulations.

We look forward to working closely with you on the supplemental EIS.

Sincerely yours,



David L. Ferrell
Field Supervisor

cc:

EPA, Atlanta, GA
NMFS, St. Petersburg, FL
NMFS, Panama City, FL
FG&FWFC, Tallahassee, FL
FG&FWFC, Vero Beach, FL
DER, Tallahassee, FL
FWE, Jacksonville, FL
DNR, Tallahassee, FL

**PLANNING AID REPORT
PORT EVERGLADES, FLORIDA
MAINTENANCE DREDGING PROJECT**



**PREPARED BY
U.S. Department of the Interior
Fish and Wildlife Service
Vero Beach, Florida**

January 1991

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EXECUTIVE SUMMARY

The Corps of Engineers has requested comments from the Fish and Wildlife Service regarding Federal assumption of maintenance dredging of Port Everglades Southport Channel and Turning Notch. Dredged material is expected to be deposited at an offshore disposal site. The disposal site is under study by the Environmental Protection Agency and approval for disposal of dredged material is anticipated to occur prior to the first dredging operations by the Corps.

The Port is a winter refuge for manatees due to the warm water effluent of the Port Everglades Power Plant. To avoid adverse impacts on the manatee during dredging, the Service recommends that no maintenance dredging be conducted during the winter months from November 14 through April 1.

If fill suitable for beach disposal is found, the Corps proposes to renourish local beaches with that material. In this event, the Service should be notified of the location and quality of the material and proposed disposal site. This would enable the Service to assess the potential for the fill to damage nearshore reef habitat. In addition, beach deposit could interfere with nesting by threatened and endangered sea turtles if deposit of such fill should occur during sea turtle nesting season. Thus, the Service recommends that if beach fill is to be deposited during the nesting season (May 15 to October 15) that the Corps initiate consultation for sea turtles under Section 7 of the Endangered Species Act.

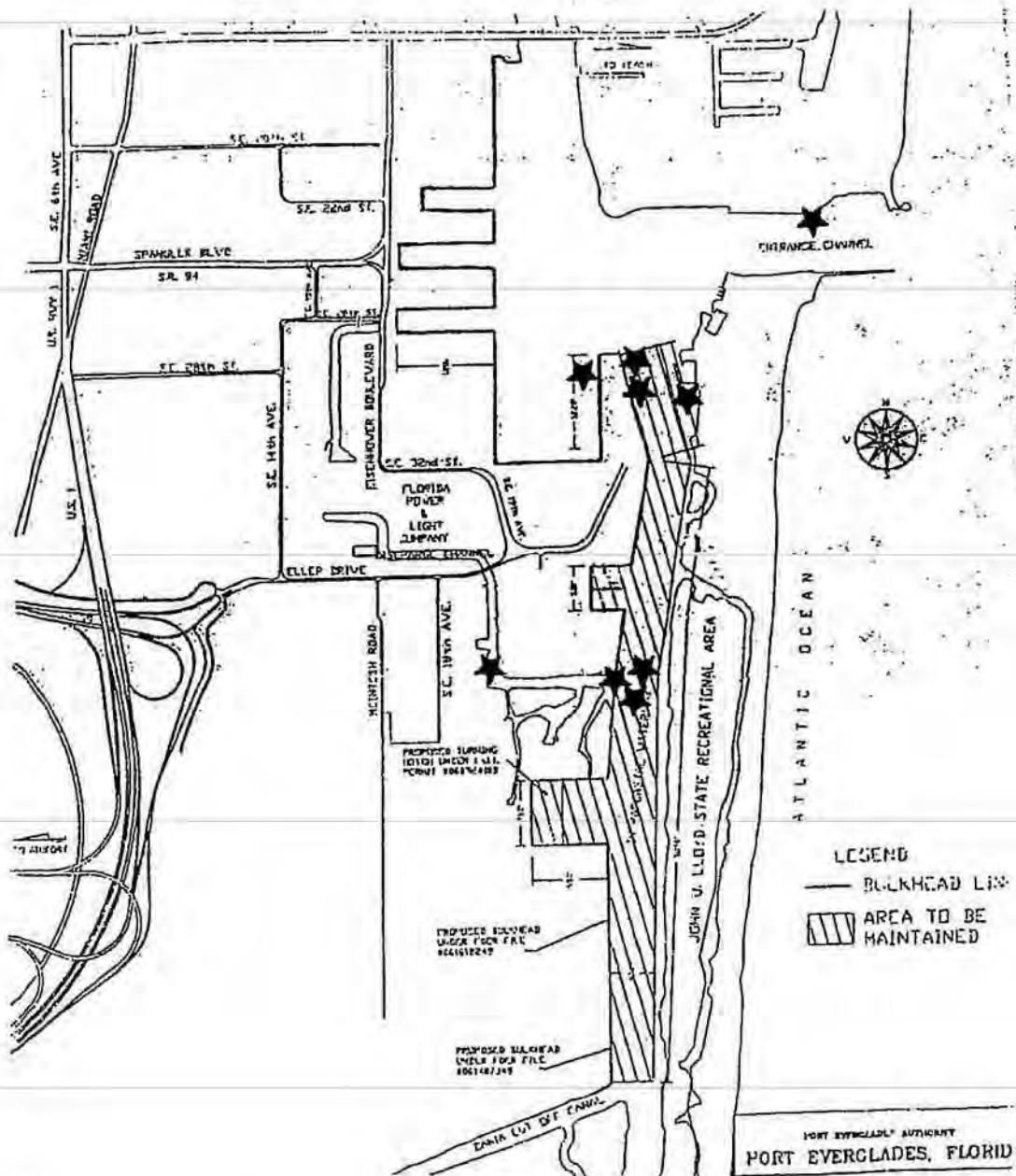


Figure 1. Project Vicinity and Project Limits.
★ Boat/Barge manatee mortalities

During ebb tide, suspended sediment would be transported out to sea through Everglades Inlet. Ocean currents are expected to disperse the sediment over a wide area reducing the negative effects to bottom organisms which would otherwise result when the sediment settles to the sea floor. Similar impacts due to settling of sediment could occur when dredging is conducted during an incoming tide. However, severe adverse impacts are unlikely due to the scarcity in Broward County of bottom vegetation such as sea grasses which would be vulnerable to such effects.

Offshore disposal area bottom. The bottom at the offshore disposal area was mapped by side-scan sonar and video under contract to the Environmental Protection Agency (Continental Shelf, 1986). Official designation of the site as an offshore disposal area is expected to be accomplished under the Marine Protection, Research, and Sanctuary Act of 1972 by EPA in 1993, prior to the first anticipated maintenance dredging operations.

B. Taxa and Important Species

Fishes. Some of the fish species which inhabit the dredge area and that area expected to lie within the area of the turbidity plume are the jack crevalle, sea cat, mullet, ladyfish, tarpon, snook, stingrays, needlefish and barracuda. All of these species are non-territorial and would leave the area where living conditions are made intolerable by the proposed dredging. Some individuals of territorial species such as the damselfishes and gobies may be lost during dredging.

Sea Turtles. Should beach disposal of dredged material occur, the supralittoral beaches, which serve as nesting habitat for threatened and endangered sea turtles could be adversely impacted. Four species of sea turtle are known to nest on the beaches of Broward County. The loggerhead turtle (*Caretta caretta*) nests primarily on beaches from North Carolina to Florida. Approximately ninety percent of loggerhead nesting within the U.S. occurs in Florida. Green turtle (*Chelonia mydas*) nesting within the U.S. occurs principally along east central Florida beaches. Nesting densities are much lower than for the loggerhead. The leatherback (*Dermochelys imbricata*) rarely nests in the continental U.S. The hawksbill (*Eretmochelys imbricata*) is also a rare nester on southeastern U.S. beaches with only 1-2 nests recorded annually in Florida.

county, with the Port Everglades Power Plant being the more significant and most heavily used of the two. As many as 251 manatees have been sighted in the Port Everglades cooling canal during winter cold spells.

Because of the potential for this project to adversely impact the manatee, the Service has prepared the following Biological Opinion.

Biological Opinion

The Fish and Wildlife Service and the Florida Department of Natural Resources have compiled manatee mortality records throughout the species' range since 1974. Over the last 15 years (from 1974 through December 1990), approximately 24 percent of the reported manatee mortalities were caused by collisions with boats and/or barges. The difference between the east and west coasts of Florida in this category is significant. Of the total mortality due to boat or barge collisions, 69 percent has occurred on the east coast, while only 31 percent has occurred on the west coast. Over 80 percent of all manatees observed in Florida carry boat-caused scars. In addition to lethal wounds, non-lethal scarring injuries may impair feeding, reproduction, and parenting activities of manatees.

Since the manatee salvage program began in 1974, 56 manatee deaths have been recorded in Broward County. Of these deaths, 22 are directly attributed to boat/barge collisions. An additional 13 manatees have died from undetermined causes, possibly including some boat-related causes.

Nine boat-related manatee deaths have been reported from the area between the project site and the mouth of Everglades Inlet since 1974. Mortalities are concentrated near two areas which pose a particular threat to manatees. Four of these animals were recovered in front of the Port Everglades Power Plant, four more manatees were recovered near the commercial port at the main turning basin, and one other was recovered from within the Inlet (See Figure 1). All of these mortalities occurred during the period of lower ambient water temperatures, between December and March when manatees are concentrated near the warm water effluent of the Port Everglades Power Plant. Six of these have occurred since 1987.

This concludes consultation under Section 7 of the Act, as amended. If there are modifications made to the project or if additional information becomes available relating to threatened or endangered species, re-initiation of consultation may be necessary.

VII. FISH AND WILDLIFE SERVICE RECOMMENDATIONS

The Fish and Wildlife Service recommends that the following be included in future project planning:

A. Project Design

1. Should material suitable for beach disposal be found within the dredge area, the Service should be notified before that material is deposited on Broward County beaches.
2. The Corps should supply the Service with the results of all silt/clay analyses of the material, the precise locations from which the material for analysis was taken, and the area selected for beach deposit. This would enable us to evaluate the potential for adverse impacts on nearshore reefs by deposit of the fill.
3. In general, we recommend that suitable fill, if found, be deposited on the northernmost beaches of John U. Lloyd State Recreation area above M.H.W. This would create a feeder beach which would gradually move seaward to replace sand from below M. H.W. which is eroded by storms or transported to the south by littoral drift.

B. West Indian manatee See Conservation Recommendations made in the Biological Opinion section of this report.

C. Threatened and Endangered Sea Turtles

1. To minimize the need for nest relocation and, therefore reduce the possibility of nest burial, crushing of missed nests, and disturbance to nesting females, deposit of dredged material on beaches should be started after October 15 and completed before May 15 (preferably after November 5 and before May 1). Otherwise, we recommend that the Corps of Engineers initiate consultation under Section 7 of the Endangered Species Act to address the possible impact of the project to endangered sea turtles.

LITERATURE CITED

Broward County Environmental Quality Control Board. 1988. Sea Turtle Conservation Project Broward County, Florida, 1988 Report. Broward County E.Q.C.B, Ft. Lauderdale, Florida.

Broward County Environmental Quality Control Board. 1989. Sea Turtle Conservation Project Broward County, Florida, 1988 Report. Broward County E.Q.C.B, Ft. Lauderdale, Florida.

Continental Shelf Associates, Inc. 1986. Field Studies in Nearshore Areas at Port Everglades, Palm Beach County, and Brevard County, Florida. Unpublished Report Prepared for the Environmental Protection Agency. Continental Shelf Associates, Jupiter, Florida.

APPENDIX B

Functional Assessment of Mangrove Habitats

Functional Assessment for Compensatory Mitigation for Impacts to Mangrove Wetlands at Port Everglades, Broward County

Impact Site Location and/or Mangrove Type	Average Height	EW RAP Valuation	Acreage	Functional Units
Mixed habitat	20'	0.70	0.64	0.448
John U. Lloyd SRA-mature	20'	1.00	0.68	0.680
John U. Lloyd SRA-mature w/ riprap	20'	0.97	0.41	0.398
Previous restoration sites	10'	0.92	0.64	0.590
Turning Notch preservation site	25'	0.85	8.48	7.210
Dania Cutoff Canal-mature	15'	0.90	0.84	0.756
Dania Cutoff Canal-stunted	4'	0.55	1.05	0.577
Dania Cutoff Canal, north side- scattered	10'	0.53	0.50	0.265
Total Functional Units Lost (i.e., Debits)				10.924

West Lake spoil island valuation = 0.21

$$(\Delta T)A = FU$$

where Δ = functional improvement of system from time of implementation to full function
 T = temporal loss factor (value from table body)
 A = minimum area of compensation necessary (does not include risk factor)
 FU = functional units

Assumptions:

- (1) 1 ft/yr growth
- (2) average current tree height: 56% at 25', 44% at 14', therefore overall mean: 20.16'
- (3) 20-year temporal lag in functionality (year finish, $YF = 20$)
- (4) compensation initiated in year of habitat removal (year start, $YS = 0$)
- (5) $\Delta = 0.97 - 0.21 = 0.76$
- (6) $FU = 10.92$

Table (version 4.2) value for YF_{20} and $YS_0 = 0.7324$ (based on 3% discount rate)

$$(0.76)(0.7324)A = 10.92$$

$$A = 19.57$$

To account for uncertainty (risk), necessary acreage is expanded to 105% of calculated A :
 $19.57 \times 1.05 = 20.55$ acres (required to compensate for loss of 10.92 FU at Port Everglades)



United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960



February 15, 2001

Colonel James G. May
District Engineer
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Colonel May:

Thank you for your letter dated February 5, 2001, regarding scoping for delivery of Fish and Wildlife Coordination Act (FWCA) reports for several beach renourishment and navigation projects in south Florida.

The U.S. Fish and Wildlife Service (Service) shares your concerns about the cumulative magnitude of the work being required for this fiscal year. Your letter suggested that the Army Corps of Engineers (Corps) could increase the amount of work that would be conducted by private contractors to complete this work in keeping with your schedule for these projects. Over the past few years, we have discussed this situation with Mr. Hanley Smith of the Corps, and the Service agreed that additional field surveys by contractors would be necessary, with the Service spending a reduced number of days in the field to essentially review the accuracy and completeness of the contractor's findings prior to the Service's preparation of draft and final FWCA reports. The timing of our ground-truthing field inspections might vary among different projects, but would typically occur after the contractor has been able to conduct their field work and has made preliminary findings about the impact of the project on fish and wildlife resources. In addition to our previous recognition of this situation, the current hiring freeze in the Department of the Interior will, in the short term, make it even more difficult to dedicate Service personnel to any more than the limited field checking described above for the projects you listed in the table enclosed with your letter. You anticipated delivery of several draft FWCA reports in April to August of this year.

The Service agrees that the Corps should obtain the necessary field surveys for fish and wildlife resources and their initial assessment of project impacts from contractors. We request that the Corps provide us the opportunity to review draft scopes of work to ensure that they include elements (e.g. maps of seagrass beds with estimates of percent cover and species composition, maps of coral reefs and other hard bottom communities, assessment of the effects of turbidity in dredging areas, etc.) that the Service considers necessary for completeness.

Ren _____

Mike _____

Kyenne _____

Bill L _____

Revise SOW w/F
and Contract

See

exam

at

R

Rea B. Port Everglades expansion

Project development/evaluation meetings	
5 days x 1 biologist	\$ 2,305
Resource assessment: field days	
2 days x 2 biologists	\$ 1,844
Resource assessment: information review and research	
5 days x 1 biologist	\$ 2,305
Prepare/review FWCA report	
20 days x 1 biologist	\$ 9,220
Subtotal, Biologist Days	\$15,674
Service Overhead (38%)	\$ 5,956
Subtotal, Biologist Days, with overhead	\$21,630
Supplies, miscellaneous	\$ 200
Total	\$21,830

Rea C. Intracoastal Waterway expansion, Lake Worth Lagoon

Project development/evaluation meetings	
5 days x 1 biologist	\$ 2,305
Resource assessment: field days	
3 days x 2 biologists	\$ 2,766
Resource assessment: information review and research	
5 days x 1 biologist	\$ 2,305
Prepare/review FWCA report	
20 days x 1 biologist	\$ 9,220
Subtotal, Biologist Days	\$16,596
Service Overhead (38%)	\$ 6,306
Subtotal, Biologist Days, with overhead	\$22,902
Supplies, miscellaneous	\$ 200
Total	\$23,102